Engineering

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ELECTRICAL REVIEW

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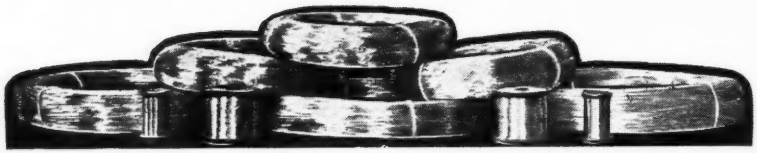

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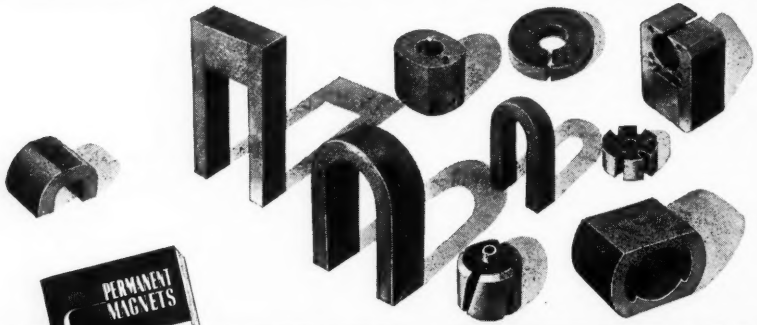

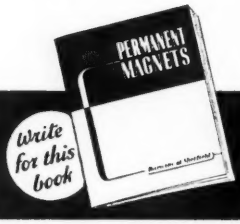

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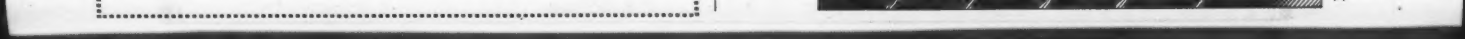

ELECTRICAL REVIEW

Volume CXXX — No. 3365

Friday, May 22, 1942

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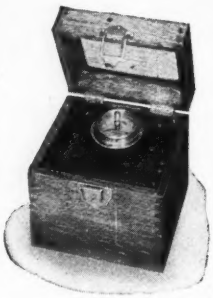

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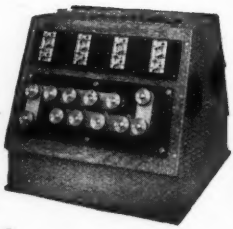

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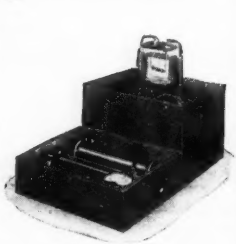

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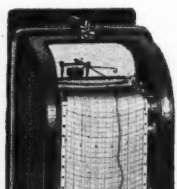

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ELECTRICAL REVIEW
THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXX. No. 3365. MAY 22, 1942 6d. WEEKLY

Insulating Oils

Essentials of a New Specification

ONE of the greatest boons enjoyed by the electrical industry is the possession of so generally satisfactory and versatile an insulating medium as mineral oil. Its merits can be exploited to the full, however, only if it is selected for characteristics that are specifically suited to each application.

The four main electrical applications, viz.:—transformers and similar apparatus, switchgear, cables and capacitors, offer scope for widely differing characteristics, the diversity of which is further increased by a number of sub-divisions under each heading depending largely on operating conditions, each of which may introduce separate problems.

Diverse Functions

Thus, the conditions involving heat dissipation in transformer tanks are quite distinct from those connected with arc quenching in circuit-breakers and both differ materially from the factors present in the use of oil as a dielectric for cables and again for condensers. As between cables, too, there is also a cleavage between the nature of the relatively viscous oil employed for impregnation and that necessary for easy flowing in the hollow-core type of contruction.

While the manufacture and refining of oil is primarily a chemist's job, the conditions to be met must be prescribed by the electrical engineer with the aid of the physicist. The need for this three-fold collaboration provided ample justification for the arrangement made by the I.E.E. Transmission Section for the presentation and discussion last week of five papers compiled by various specialists from the standpoints of production technique, chief applications and maintenance in service.

The data brought together by the authors and also by many of the contributors to the discussion should be most helpful when the basis of B.S.S. 148 comes up for reconsideration. The current nine-year-old edition, with its division of oils into two classes according to sludge values as ascertained by preliminary tests, although serving to eliminate definitely unsuitable material, bears little relation to the more positive requirements of modern practice, even with regard to transformer insulation to which it was mainly relevant. The defects of the present system have been emphasised by the showing-up of the pretensions of the over-refined Grade A, which compares unfavourably with " pool oil " (the equivalent of the less expensive Grade B) in acidity effects and even in sludge formation over a period of operation.

Specification for Testing

No one test, or general series of tests, will furnish all the information requisite to the needs of every user (see Coursey and Gough, *Electrical Review*, August 29th, 1941). Immediately circumstances permit, a revision of B.S.S. 148 on a much more comprehensive scale should be undertaken with a view to prescribing appropriate tests, leaving to the user the selection of those most suitable for his purpose.

Although a new specification would consolidate and apply advances in knowledge

of the subject to good purpose, it would not of itself be enough to enable full advantage to be taken of improvements in manufacturing technique. The last word has by no means been said on such matters as the relationships of various characteristics of oils to operating temperatures, deterioration in use, the effects of carbonisation due to arcing, resistance to oxidation and gassing, catalytic action of metals and the safety limits of cleaned oil. It is evident that the inherent properties of oil are of sufficient value for electrical applications to warrant further extensive research.

Quarrying

IT is only during the past few years that the electrification of single-bucket conveyors has made headway and the paper presented by Mr. P. H. R. Durand before the I.E.E. Transmission Section embodied data that has hitherto been very difficult to come by. Requiring a rating of only about 60 per cent. of that of a corresponding Diesel engine, the electrical drive offers great promise if full advantage is taken of experience gained in working conditions. Normally it presents a case for the use of high-voltage motors in view of the size of the trailing cables otherwise necessary to provide reasonably close voltage regulation.

Cable Drums

IN this issue Sir Thomas Purves, Director of the C.M.A., makes another request for the rapid return of empty cable drums to the makers and from our knowledge of the urgency of the matter we reinforce his appeal. It is realised that transport difficulties sometimes frustrate the best desires of cable users but it is not always the railways which are to blame. With the present shortage of timber and labour customers can assist the industry, the country and themselves by sending back drums as soon as possible after the cable has been laid.

The Derby Salary

ONCE again the fear that the borough electrical engineer will receive more than the town clerk has resulted in a departure from the scale agreed upon by the Joint Committee of Local Authorities and Chief Electrical Engineers. This time it is at Derby where, on the appointment of Mr. F. H. Pooles, it was agreed that his salary should be in accordance with the agreement subsequently made. But at the recent Council meeting (as reported in our last issue) it was pointed out that under this arrangement the salary might reach £2,000 by 1950 and this, according to some members, would place Mr. Pooles " upon a pinnacle above all Corporation officials." Although the chairman of the Electricity Committee maintained that the Corporation should honour its undertaking the Council decided not to adhere to the scale.

Rationing Deferred

IN view of the opposition voiced in the Commons debate on fuel rationing it was almost a foregone conclusion that the Government would hold up its scheme based on Sir William Beveridge's report. In a letter to *The Times* last week, Sir William stated that his task was now ended but he endeavoured to clarify some of the issues in " this vexed and vital problem." He said that he had been reproached for the speed with which he had carried out his task, but this was entirely to his credit and we think that if he had worked on the matter for another year he could not have devised anything better. It has been impressed on the Government that while rationing may ease the burden on the coal industry only the proper organisation of that industry will get the country out of the awkward situation which has arisen as a result of past errors and the new proposals will take account of this.

Preventing Price Rises

ELECTRICITY supply authorities will sympathise with the views of Sir David Milne-Watson on price control expressed at last week's meeting of the Gas Light & Coke Co. He recalled Sir Kingsley Wood's statement in 1941 that the restrictions on prices of essential commodities would cover coal, gas and electricity. That policy had been carried out, but whereas suppliers of other commodities had been compensated by subsidies, so far the company's stockholders had borne the burden, apart from a small permitted increase which was no more than sufficient to cover the higher cost of coal, oil and wages. The question is one which we raised a year or so ago, but it does not seem to have become an urgent matter for the electricity supply industry yet.

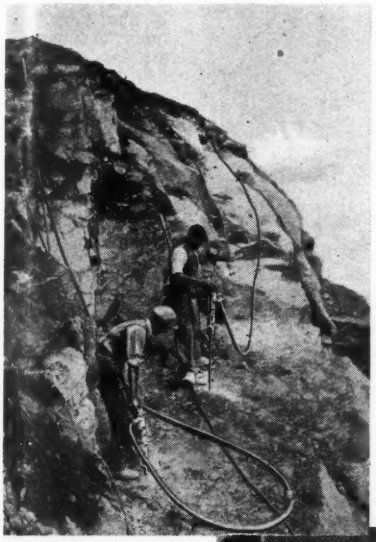
Lime Production

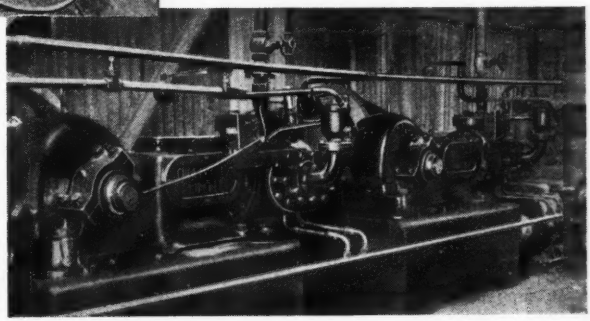
Extensive Use of Electricity

In view of its importance in agriculture for the maintenance of soil fertility lime has assumed an especially prominent position in wartime, and the demand for it has increased enormously

MR. R. S. Hudson, Minister of Agriculture, stated in the House of Commons last week that the Government had under urgent consideration the question of the maintenance of lime supplies for farmers for the 1942-43 season. In this connection the following account of how output has been stepped up by modern methods is of special interest.

When the Callow Rock Lime Co., Ltd. started operations in 1920, its lime burning plant was, it is believed, the first of its type in this country, being specially designed to produce lime of high quality without contamination.





Pneumatic rock drills at work in the quarry and (right) compressors serving the drills

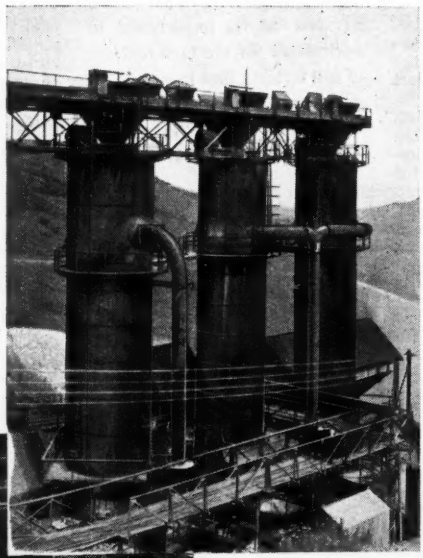
The works have always been entirely electric, and as certain vital parts of the plant, notably the fans for the kilns, require a high degree of speed variation, DC was considered most suitable. Initially this was supplied by suction gas engines generating at 230 V. In 1925, however, the local electricity supply authority offered to bring its mains to the works if the company would take the whole of its supplies from them. It was decided to accept this offer, and an 11-kV, 3-phase, 50-cycle AC supply was taken, a 217-kVA Hackbridge transformer and two 325-A Hewittic rectifiers providing the necessary low-voltage DC. This installation the company has found to operate most satisfactorily. When any extension or modernisation of the plant has been necessary, however, 400-V AC has been adopted if convenient, and to furnish this a 250-kVA Hackbridge transformer has been installed with a low-voltage switchboard (Christy Bros. & Co.). The main 11-kV switchboard was supplied by Crompton Parkinson, Ltd.

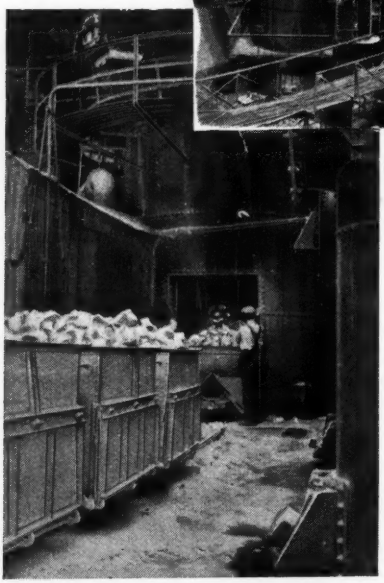
Extensive quarry work is carried out to obtain the limestone required. Compressed air drills operated by compressors driven by 15-HP, 1,440-RPM motors are used on the quarry face, electrical means being employed largely for shot firing. After blasting, the stone is broken down by hand to lumps of not more than 6 in. and loaded on to trucks, which, in the case of the lower workings, are raised to the level of the top of the kilns by means of a Clarke Chapman winch driven by an 8-HP motor running at 720 RPM and controlled by a B.T.H. tramway type controller.

Conversion of the limestone into quicklime

is carried out by the most modern continuous methods by means of four vertical gas-fired, induced-draught kilns. The stone is tipped from the trucks into hoppers directly above the kilns, Lancashire Dynamo DC compound motors of 3 HP being utilised to operate the sliding doors at the bottom of the hoppers. Limit switches are installed to prevent overrunning and the motors are also provided with tramway type controllers.

The kilns, which consist of steel casings lined with firebrick, are fired by means of gas generated from coal in five continuously operated gas producers. These are blown by a mixture of air and steam, the former being supplied by Keith Blackman direct-coupled, high-pressure blowers, while the latter is produced in waste heat boilers in series with the induced draught system of the kilns and using the heat of the waste gases from the kilns. The gas is supplied in the hot state direct to the kilns, controls being provided by valves at four different points on each kiln to enable the supply of gas to be kept sufficiently constant. Ashes can be removed from the bottom of the gas producers *via* water seals without interfering with the operation of the plant.





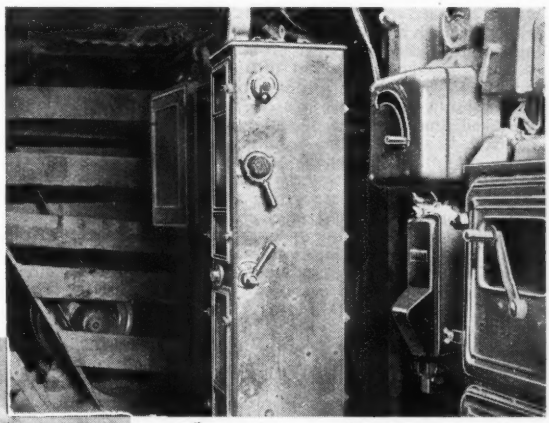
General view of three of the kilns and (below) drawing lime from a kiln

After being loaded into the top of the kilns, the lumps of limestone are dried and preheated before reaching the burning zone where a temperature of 1,100 deg. C. is maintained. When the burning process is completed the stone is cooled in the bottom portion of the kilns preparatory to drawing off through cones with discharging doors in the bottom. Passage through the kilns takes about two days, and during the process about half the weight of the limestone is driven off as carbon dioxide gas, the final product, quicklime, having retained the shape and size of the original stones but being white in colour instead of grey and, moreover, being very noticeably lighter in weight.

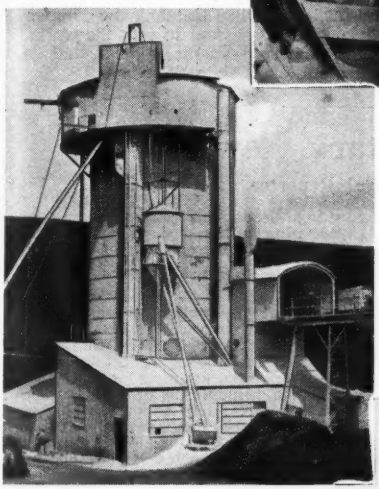
It will be realised that since the exhaust gas contains both the burnt gases and the carbon-dioxide given off by the stone, a very large weight of gas has to be handled. Powerful motors are therefore required to operate the induced-draught fans, and speed variation is necessary to control the draught. Accordingly, "Sirocco" units are driven by 25-HP, 500-750 RPM Lancashire Dynamo motors in the case of two kilns and by a 40-HP, 500-1,000 RPM motor of the same make for one fan serving two kilns. The quicklime is drawn from the kilns about every three hours and taken away in trucks for hand sorting and screening prior to storing in bunkers which are specially ventilated by a motor driven fan and a system of ducts. The capacity of the kilns is approximately 250 tons of quicklime a week each.

In lump form quicklime is much in demand

in peacetime for builders and chemical manufacturers. Under present conditions, however, the greatest part of the output of the works is in the form of coarse powdered quicklime, which is supplied in paper bags for direct application to the land under the Government's Land Fertility Subsidy Scheme, by which agricultural users can obtain a subsidy of 50 per cent. of the cost of the lime and carriage. The grinding machine used for the crushing is a swing hammer type unit fitted with grids of appropriate mesh. An interesting feature of this machine from the electrical point of view is that the power



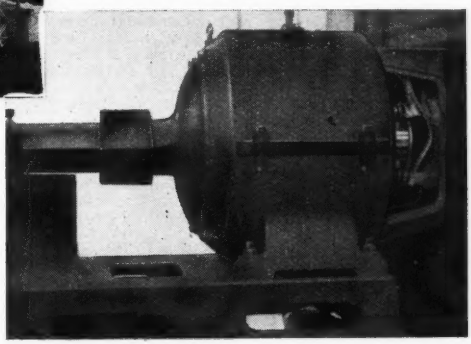
Control gear for the hydration plant



Lime hydration plant and storage bunker for hydrated lime and (right) 40-HP, variable speed motor driving the fan of the air separator in the hydration plant

unit is duplicated. A Lancashire Dynamo DC motor of 40 HP, running at 1,000 RPM is connected by means of a Renold-Hardy flexible coupling to one end of a countershaft, at the other end of which, connected by a similar flexible coupling, is an English Electric AC motor of 35 HP and 965 RPM. Either power unit may thus be used by the simple transposition of the coupling disc, so enabling preference to be given to either the AC or DC supply for the purpose of controlling the maximum demand charges.

A third outlet for lime is in the production of hydrated lime, in the manufacture of which the company was a pioneer. Briefly, the process consists of the addition under controlled conditions of sufficient water to the quicklime to slake it to a dry powder. The lump quicklime is first crushed and then fed by means of a worm screw into a slaking trough fitted with paddle arms where the required amount of water is added, and it ultimately emerges from the end of the trough as "crude hydrate". A washing plant for recovering dust which would otherwise pass into the atmosphere is installed alongside the trough. The main driving motor for the hydrating plant is a 50-HP, 625-RPM Crompton unit, that for the



recovery plant being a 15-HP, 1,750-RPM, Greenwood & Batley motor. The output of the hydrating plant is approximately three tons an hour.

A Fletcher bucket type elevator takes the crude hydrate to a hopper whence it goes either through a screening process for use as agricultural lime or through an air-purifying process for the production of the highest grade material. This process consists of blowing out the coarse material, such as unslaked lime, particles of stone, etc., by a controlled air-flow, the resulting powder being of flour-like fineness, easy to handle, safe to store and extremely consistent in quality. For the air separating system the fan is driven by a 40-HP Lancashire Dynamo variable-speed motor running at from 560 to 960 RPM. For working certain auxiliaries, including the elevator used for taking the crude product to the separation system, there is a 12½-HP, 835-RPM, Phœnix enclosed ventilated type unit. From the storage hopper the lime is bagged by semi-automatic bag filling machines.

A considerable quantity of water is required in the works, and to provide this a private supply system has been developed. Three-quarters of a mile from the factory an 8-in. borehole has been sunk to a depth of 500 ft., from which water is drawn at 680 gal. per hour by a deep well pump operated by a 4-HP Brook high-torque 960-RPM, AC motor through worm reduction gearing, automatic control being achieved by means of a float switch. From the borehole the water is delivered to an intermediate tank where a 1,000 gal. per hour 3-ram Tangyes pump, driven by a B.T.H. 5-HP, 450-RPM, DC motor raises it a further 400 ft. to the works storage.

From September to May is the busiest period of the year at the works, about 50,000 kWh a month being consumed. During the remainder of the year the monthly consumption falls to about 35,000 kWh. Many processes being continuous, a large proportion of the electrical load is almost constant, while certain parts of the plant operate as far as possible at night to equalise the load.

We should like to thank the company for giving us permission to visit the works, and also for the assistance of its staff in the preparation of this article.

Parliamentary News

By Our Special Reporter

Fuel Rationing

IN the House of Lords on May 12th, Lord Elton called attention to the prospective coal situation, which he attributed to the Government's miscalculations, and to the proposals for dealing with it. He maintained that the fuel-economy propaganda had been half-hearted and in some ways contradictory. If a hundredth part of the energy which had been put into warship weeks had been devoted to a campaign for economy the present situation would not have arisen. He suggested that there should be a closer examination of the uses to which coal was put in the case of some of the big industries. People would make any sacrifices for victory if they were shown to be unavoidable. If there had to be rationing he hoped that it would be fair.

Lord Gainford strongly repudiated the charge made by Mr. Greenwood in the House of Commons that vested interests had entered into a deliberate campaign against rationing. The fuel industries had undertaken to do their utmost to carry out any plan introduced by the Government.

Lord Snell, replying for the Government, said that the Government was not wedded to the present rationing scheme and was seeking to improve it, but it had the advantage of being fair and it was, he thought, as simple as such a scheme could be.

In the House of Commons on May 13th, the Lord Privy Seal (Sir Stafford Cripps) informed Mr. Greenwood that the Government had decided to defer the question of fuel rationing. After Whitsun the Government's coal proposals, covering production, consumption and the organisation of the coal industry, would be submitted to the House.

Scottish Industry

In winding up a debate upon industrial development in Scotland in the House of Commons on May 12th, Mr. T. Johnston (Secretary of State for Scotland) said that endeavours were being made to secure a fair share of Government orders for Scotland and to prevent the drifting away of Scottish industries. It was useless to talk about planning for the export trades until they knew how the war was going to end. He had therefore confined himself to planning for domestic issues, such as land settlement, hydro-electric development, etc.

Austrian Engineers' Association

THE Association of Austrian Engineers, Chemists and Scientific Workers in Great Britain has been formed with the object of assisting its members in their professional work and interests, representing them with the authorities, promoting contact and relations with British colleagues, forming a link with the British scientific and technical institutions and ensuring that better use is made of the knowledge and abilities of Austrian engineers, chemists and scientific workers who are eager to do their best in the war effort.

The acting chairman of the association is Dr. F. Ehrenfest-Egger, and the hon. secretary is Mrs. K. Hilfreich, 133, Hatherley Court, W.2. A clubroom will be open for members at the Austrian Centre, 69, Eton Avenue, N.W.3.

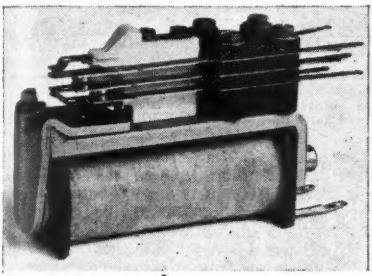
Relay Contacts

A New Material for Heavy Duty

By H. R. Brooker

THERE has been a growing tendency in recent years to use modified types of standard G.P.O. relays for a variety of industrial purposes. A number of changes in the constructional detail of these relays has been necessitated by their use at domestic voltages and by the greatly increased currents which they have been required to handle. Most of these changes have been logical ones which have caused designers little trouble, but a good deal of attention has had to be paid to the important detail of contact materials.

Current practice in relation to G.P.O. telephone relays is to use platinum and silver as alternative contact materials. The division of the electrical duties for the respective metals is somewhat arbitrary and, with the small currents normally encountered in telephone work, silver and platinum differ chiefly in their liability to form tarnish films in industrial atmospheres. But in many cases relays adapted for other industrial uses are required to interrupt currents which very greatly exceed those employed in telephone work. Platinum is not a suitable contact material, owing partly to the high cost of the larger contacts which must be fitted and partly to the poor resistance of the metal to the destructive effects of arcing.

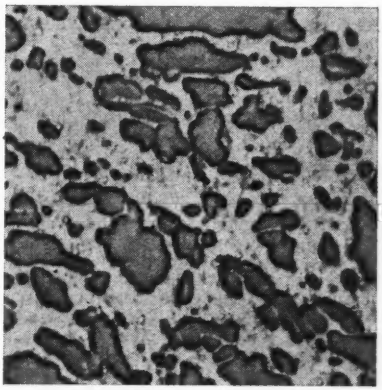


Heavy-duty G.P.O.-type relay with silver-nickel contacts for high-voltage and high-frequency circuits (Siemens Bros. & Co., Ltd.)

Silver has frequently been used, in many cases with success. Under particularly arduous conditions in AC circuits, however, silver contacts fail by welding at "make" while, in DC circuits, they suffer from the familiar phenomenon of "carry over" or "material transfer." In inductive DC circuits such material transfer can rapidly cause appreciable alterations in the gap between the contacts and may even cause failure by complete bridging of the gap, or by permitting mechanical interlocking of the spike or mound on the positive side with the corresponding crater on the negative.

For such heavy duty, tungsten contacts have been used for some time. The tendency to weld or stick is almost entirely absent with this material and the resistance to material transfer is greatly reduced. But tungsten suffers from a great disadvantage in apparatus where only quite moderate spring pressures are available in that the oxide film produced by arcing is very tough and often gives rise to quite inadmissible degrees of contact resistance.

Few materials are available which combine a reasonably low contact resistance with any marked ability to withstand the destructive effects of arcing. Certain of the silver-molybdenum and silver-tungsten "Elkonite" powder metallurgy combinations have been employed in heavy-duty relays with results which, on the whole, are satisfactory. These materials are, however, primarily contact metals for larger gear where far greater mechanical pressures between the contacts are available to off-set the increased contact resistance as compared with silver. Although marked improvement in respect of tendency to fail by welding is offered by these materials, they suffer, like tungsten, from not being



Microstructure of "Elkonite," showing finely dispersed particles of nickel in silver matrix, the nickel being responsible for relative freedom from sticking and resistance to wear and arcing

ductile, which involves the more expensive procedure of making up contacts by attaching a facing of the contact metal to a base metal table capable of being riveted into the blade.

The required compromise between ability to withstand the destructive effects of arcing and the liability to material transfer on the one hand and low and reasonably constant contact resistance under fairly light spring pressures on the other hand seems to be offered by a new powder metallurgy product known as silver-nickel "Elkonite." In addition to the fact that this material is obtainable at a cost which is not disproportionate to that of silver, it has the further advantage of ductility, which enables it to be employed in the form of solid contacts capable of being riveted into blades. Silver-nickel is also obtainable as wire and strip and as an inlay in the contact bi-metal has been widely adopted in recent years.

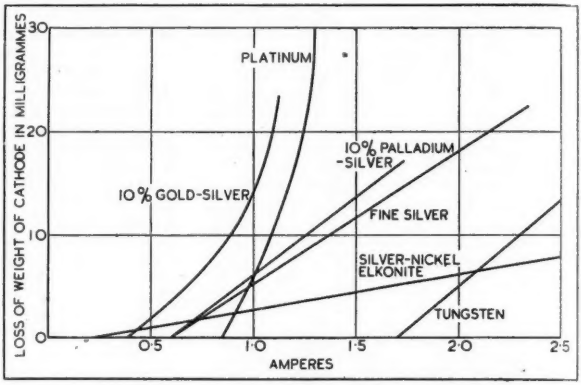
From the brief list of physical properties given in the accompanying table it is seen that the annealed hardness of silver-nickel

SILVER-NICKEL "ELKONITE" COMPARED WITH FINE SILVER AND TUNGSTEN

Property	Silver	Silver-Nickel	Tungsten
Vickers Diamond Pyramid hardness (annealed)	26	68	290
Resistivity, microhms per cm.3	1.60	2.41	5.48
Conductivity, per cent. I.A.C.S.	106%	72%	31%
Thermal Conductivity, C.G.S. units ..	1.006	.74	.39

compares favourably with that of silver, while its conductivity appreciably exceeds that of tungsten. The relative tendency to material transfer at different current values indicated by the curves was determined after 400,000 operations at 110 V rectified DC. Transfer of silver-nickel commences at a lower current than is the case with tungsten, but the slope of the curve is far more gradual. The experimental results obtained indicate that tungsten is transferred at a greater rate than silver-nickel when the current exceeds about 2.1 A in the circuit conditions employed.

Under service conditions in heavy-duty relays, the contact resistance of silver-nickel approaches that of silver. Satisfactory life periods have been obtained when handling 8 to 10 A in 250-V, AC circuits and 3 to 4 A in DC circuits of low inductance. In the latter instance a spark-quench device in the form of a selenium rectifier was employed. It is expected that these current values would be reduced under highly inductive conditions, or if no spark quench were included.



Comparative tendencies to "material transfer" from negative contact of various metals

Experimental work indicates that the order of freedom from sticking of a number of common contact materials is as follows: tungsten, silver-tungsten "Elkonite," silver-molybdenum "Elkonite," silver-nickel "Elkonite," 10 per cent. gold-silver, silver, 60 per cent. palladium-copper, platinum-gold-silver, palladium, commercial platinum, and 20 per cent. iridium-platinum.

Recommendations concerning the contact material to be used for any given electrical conditions must be made with the greatest reserve. But, from the interest which this new material has evoked during the short time it has been available, it may be inferred that silver-nickel is likely to become, for exacting electrical conditions, a familiar alternative to more common materials.

Foremanship Training

A SET of notes on which lectures may be based by instructors in the Ministry of Labour course on foremanship training is obtainable from the Institute of Industrial Administration, Artillery House, Artillery Row, Westminster, London, S.W.1, for 2s. 6d., post free. A book entitled "Introduction to Foremanship" is also to be published shortly. It is hoped that the training course for lecturers initiated by the Institute and the Regent Street Polytechnic will help to rectify the dearth of lecturers on this subject.

Substitute Materials

Need for Forward Planning

By G. A. Williams, Assoc.I.E.E.

THE term "conservation of material" represents no new thought to the designer of articles for quantity production, or of portable appliances of quality. It can be effected by the use of lighter or higher-quality materials, by taking advantage of modern production methods such as pressure die castings (which allow thinner sections—stampings or forgings), by giving finished or near-finished shapes from the minimum of stock, by tube manipulation, by the use of moulded compounds and by utilising to the fullest extent modern methods of fabrication, which avoid unnecessary machining and reduce man-hours.

In the past, industry used substantial quantities of aluminium, brass, copper, chromium, nickel, tin, zinc, mica, cork, plastics and rubber, in addition to huge quantities of iron and steel. Substitute or new materials to replace certain of these are necessary, but forward planning is essential because, as materials become scarcer, it may be necessary to find further substitutes.

Reviewing possible alternatives in the electrical field the author points out that as materials become scarcer it may be necessary to find further substitutes; it is thus essential to plan ahead

Aluminium offers such advantages that substitution necessitates sacrifices beyond the mere increase in weight. Similar facility in working and ability to obtain particular varieties of self-finish are qualities not easily obtainable in alternative substances. Magnesium alloys also are restricted so, possibly, where moulded compounds meet the manufacturing and strength requirements, the weight question might be met by their judicious use. The substitution of steel for sheet material or pressings need not mean *pro rata* increase in weight, as a thinner-gauge steel will usually provide equivalent rigidity and strength.

For aluminium alloys previously used in the die-cast form, a suitable substitute will be found in the zinc-base alloys. The change-over can usually be made without modifications of the dies, although new dies will sometimes be justified if only because of the greater detail and more successful use of cores possible with the lower melting point of zinc-base alloys. Costs would hardly be affected on a direct change-over because, although the weight of the zinc-base casting would be about 2½ times that of the aluminium casting, the material costs per pound are only about one-third for zinc-base alloy. For rotating parts the question of the effect of increased weight would need consideration because the multiplication of centrifugal forces is greater than the gain in strength.

Although the use of copper, as of other basic materials, is controlled, quantities have been released for such essential purposes as motor and control gear and wiring, but the present relatively satisfactory position will not necessarily persist. For most electrical purposes there is, however, no satisfactory economic alternative.

Supplies of iron have been satisfactory up to the present, but the restrictions on hematite iron have necessitated substitution by low-phosphoric or other refined grades, restrictions on these in turn resulting in substitution by the higher-phosphoric grades. The limited supplies of steels and light alloys have extended the use of the modern high-duty cast irons, and malleable or grey-iron castings are replacing steel castings in numerous instances.

Until recently the rubber situation had given little cause for concern, but severe restrictions must result from the Japanese invasions, as our world-wide trading contacts and tendency to rely on overseas products have not encouraged quantity production of artificial rubbers in this country. The use of paper insulations will extend, and for internal wiring in apparatus greater use may have to be made of porcelain beads to conserve rubber where possible, but as this can be only a relatively minute saving, probably the development of thermo-plastic coverings for cables will provide a substantial relief and is worthy of every encouragement and stimulus. Although the different compositions of thermo-plastic materials are possibly being considered for cable coverings primarily as substitutes for rubber, they will probably develop on their own merits as a new high-class material. The success of the styrene grades in high-frequency service and the demands on them for communications and radio apparatus will probably restrict their use to direct war purposes. Similarly, the vinyl resins command attention for cable insulation, although their use could be justified on technical and economic grounds.

The control of plastics has recently been extended and licences are required for their acquisition, treatment, use, consumption or

disposal. Their use, however, can usually be justified because of the wide field they cover and the astonishing economies and rapid increases in production they make possible for such purposes as the manufacture of lenses, which, while competing with glass, offer in addition practical unbreakability.

Within the plastic range of materials considerable substitution is possible since both the bonding and filling mediums can be of varied types. For instance, with the ordinary phenol-formaldehyde resin as a bonding medium the fillers may be fibre, mineral, or wood-meal, or any reasonable combination of these. Fibre-filled materials are essentially useful for purposes where shock resistance is required. Mineral-filled products, while not so strong mechanically, possess increased resistance to heat and this advantage can often be combined with superior electrical characteristics. The wood-filled variety affords a very useful general-purpose material, while the synthetic-resin bonded laminated paper or fabric products are very strong mechanically and sometimes form an acceptable substitute for sheet steel, as witness recent developments in car bodies.

It is probably within the range of steels that the greatest possibilities occur for alternatives. Nickel and tungsten steels rank high in the priorities, while restrictions on other alloying elements will compel the use of lower-grade alloy or non-alloy steels. For items of reasonable size recourse may be had to the medium- or low-carbon steels which can be satisfactorily heat-treated, but the determination of substituting grades will require careful consideration of the class and properties of steels previously used and known to give a satisfactory performance on a specific job.

Comparison of respective properties may suggest an alternative which in instances may be found to offer advantages in easier machinability, ease in processing or hardening characteristics. Changes in heat-treating technique may be found necessary, with checks on the control of the treatments previously used, if required characteristics are to be maintained within close limits, while in some cases changes in design of apparatus may be necessary to meet the changes in properties of steels available. The choice of an alloy steel may originally have been due to considerations involving convenient machining practice or heat-treatment plant and technique, and these factors will need balancing with the requisite mechanical properties. Compromise can usually be effected even though it may involve redesign of details to reduce working stresses.

Where a project carries the highest priority the highest quality materials could be specified, but as the priority materials often involve delivery times which are outside the acceptance limits, alternatives are frequently chosen for this reason alone, quite apart from any considerations of production convenience or economies.

Molten-Steel Temperatures

THE actual distribution of temperatures in three dimensions within liquid steel in different kinds and sizes of furnaces is recorded in an Iron and Steel Institute paper by Messrs. D. A. Oliver and T. Land (Research Department, W. Jessop and Sons, Sheffield).

Correlation of large-scale steelmaking with more precisely conducted experiments had been handicapped by the serious vagueness regarding the actual temperatures reached that was universal until the advent of special kinds of thermo-electric pyrometers. So far as Britain is concerned the Schofield-Grace quick-immersion type is the unchallenged survivor and is rapidly superseding all other methods. It is particularly suited to melting-furnace determinations; since the thermo-couple (composed of platinum and platinum with 13 per cent. rhodium) is enclosed in a very thin silica sheath, it very rapidly responds when moved about in the molten bath.

Temperatures are deduced from tabulated electromotive forces, which are generated by the thermocouples, being measured by accurate potentiometers of the self-contained type with very open scales properly calibrated. Some observations have been made with a recorder and amplifier of novel design that have been specially developed for routine measurements.

Electric arc furnaces of the three-electrode Heroult and two-electrode bottom return types have been surveyed in particular detail. As in the case of Siemens acid open hearth furnaces, while the bath is boiling the temperature is remarkably uniform. It seems that the top 12 in. of the metal normally varies in temperature by about 15 deg. C. Below it there is frequently a cooler layer which is not always disturbed by the process of rabbling. Metal within 3 in. of the bottom of the bath is occasionally from 50 to 70 deg. C. below the temperature of the hot metal above it.

The uniform temperature layer comprises about three-quarters of the metal in the furnace. The average temperature of the cooler remainder may be from 20 to 30 deg. C. below that of the upper portion. Temperature measured at a depth of 6 in. below the surface should be the average of the whole bath with an error of not more than 10 deg. C. Though the same general trends are observable in smaller arc furnaces, they

enable more thorough mixing to be done, so that variations are rarely found to exceed 10 deg. C.

The metal in high-frequency furnaces undergoes very violent agitation while the heating current is passing through the coil, but temperature is frequently measured with the current switched off. At the bottom of the furnace temperature falls initially much more rapidly than at other positions, but later there is slower cooling and then temperature falls more quickly at the centre and nearer the top.

The explanation of this is that the metal near the sides cools rapidly by conduction through the furnace walls and falls to the bottom where a cool layer is built up, which remains at a relatively steady temperature. It would appear that determination at a depth of 4 in. is likely to differ from the true mean by less than 10 deg. C.

In basic arc furnaces the vertical gradient tends to become considerably greater than in acid open-hearth furnaces. Frequent rabbling usually keeps the gradient down to about 10 deg. C. per ft. in the upper layers although differences of more than 50 deg. C. may occur near the bottom. Therefore if a suitable place is chosen for a single measurement of the temperature of the liquid steel, the deduced result should not differ by more than 10 to 15 deg. C. from the true average of the bath.

Owing to thermocouple effects and unavoidable errors of observation there is a further possible instrumental error of plus or minus 50 deg. C. The final absolute uncertainty may thus approach plus or minus 20 deg. C., but in most normal cases the error is likely to be of the order of plus or minus 10 deg. C. Thus there should not be many occasions when it will be advisable to make several measurements at two or more positions in the bath.

INSTITUTION PROCEEDINGS

Electricity in Quarrying. I.E.S. Progress.

Water Power for Metallurgy

BECAUSE water power enables electricity to be produced cheaply in large quantity it is a valuable asset of the metallurgical industry, both in mining ore and for its reduction to the finished metals. That was the reason for the choice of the subject by Mr. W. T. Halcrow (consulting engineer) for the annual May lecture to the INSTITUTE OF METALS in London last week.

Some particulars were first given of typical plant at home and abroad, followed by a brief review of potential hydro-electric power awaiting development. In order that the best use might be made of untapped reserves, especially within the British Empire, comprehensive inland water surveys were considered to be necessary. In support of a statement that electricity could be produced by water power at a cost below that of steam generation, the lecturer referred to the factors that governed the cost in each case. Potential resources at home and abroad were discussed, as was also the promotion of schemes in this country.

Electricity, he said, was the most convenient form of power for producing many metals and alloys; in some cases it was essential, as for the manufacture of aluminium, sodium, calcium and (by certain processes) magnesium. In others, it was more economic and improved the quality of the finished product, as in the cases of copper, lead, tin, nickel, gold and silver, Also, electricity might be advantageously utilised in the winning processes of copper, zinc and cadmium, while economy and greatly improved quality were factors in the cases of such alloy products of electric furnaces as ferro-tungsten, ferro-vanadium, ferro-silicon, ferro-manganese and ferro-chrome. It was almost essential to the production of graphite, silicon, calcium carbide and fused alumina.

The reduction of aluminium and magnesium required 20,000 kWh per ton, zinc 3,500 kWh and copper 250 kWh, excluding power absorbed in mining the ores. Such figures conveyed some idea of the enormous amounts and greatly varying demands that necessitated cheapness of power. Relative costs of power and transport must also be studied, since the bulk of ore to be carried was invariably greater than the weight of metal extracted therefrom; about 1 ton from 15 in the case of aluminium (just over a quarter of the total raw materials being used at the electric furnace). Thus fifteen times the shipping space was needed to import the unfinished materials rather than the metal, but it was highly improbable that all the raw substances would be found where the primary ore was plentiful.

Owing to the limited potential water-power resources of the British Isles their electro-metallurgical industries served hydro-electrically must be developed abroad rather than at home. Large plants had, in fact, been established in parts of the British Empire where the potential water power available for

development was immense. The United States had at present the largest output of hydro-electric power devoted to metal production, some of the more recent plants having been planned on a scale that had necessitated some of the largest structures ever built by civil engineers.

The lecturer then briefly detailed some of the more important installations in the United States, Canada, Australia and Tasmania, Norway, Sweden, Italy, France, Switzerland, Germany, Russia and the British Isles. Of the total outputs of over 418,000 HP in Scotland and 70,000 HP in England and Wales, rather more than 30 per cent. was devoted to the production of metals.

Comprehensive inland water surveys should include systematic gauging of all major rivers, the keeping of snow and rainfall records and study of absorption, evaporation and ground storage. Such records were of value in computing the water available for use when river gaugings had not been made and only rainfall data were available. To ensure continuity and availability of information to all who might wish to make use of water the collection of basic information was undertaken by Government bureaux in the United States, Switzerland, Italy and the Scandinavian countries. Too little attention had been paid to this subject in Britain.

Variation of power supply was of little consequence in the production of some metals, but not in others; in many cases alternative schemes of river regulation, or water storage and stand-by plant, must be worked out in great detail before the best solution could be arrived at. One reason why the lecturer favoured continuous operation was that the capital cost of hydro-electric works increased as the plant load factor decreased.

Capital and Production Costs

Comparison of the costs of power derived from water and coal frequently led to controversy and misleading argument. It was not correct to assume that, because the capital cost of water-power plant was admittedly much greater than that of a steam station, the price at which the electricity produced could be sold must also be higher. In references to factors that controlled cost in each case the lecturer remarked that careful comparative study in 1936-38 showed that the cost of power generated by steam near a coalfield with fuel at 15s. per ton was about double the cost of power from water in Scotland. At to-day's prices the margin would be still greater, while an important advantage was that the maximum water-power cost was known when the station started to operate, whereas the price of fuel fluctuated and might soar at times.

In estimating potential water power throughout the world, the lecturer mentioned 107,000,000 HP as being available in 24 countries within the British Empire, of which only about 6 per cent. had been developed. He suggested that the 1,257,000 HP potentially available in the British Isles could be developed economically, mentioning several schemes that had been proposed. Ireland's resources were placed at 500,000 HP; in Scotland 650,000 HP could be harnessed with 67,000 HP in England and 134,000 HP in Wales, although the only attractive sources were in the Scottish highlands.

The lecturer concluded by briefly indicating the kind of opposition encountered in Parliament by promotors of Bills proposed for the development of water power.

Electric Excavators

AN instructive kinematograph film showing machines in operation preceded the paper on motor-driven excavators for quarrying and outcrop mining (see *Electrical Review*, May 15th, 1942, p. 636) that was presented by Mr. P. H. R. Durand (Ruston-Bucyrus, Ltd.) to the Installations Section of the INSTITUTION OF ELECTRICAL ENGINEERS last week.

Mr. J. A. B. Horsley (Mines Department) opened the subsequent discussion with the remark that there was probably some 200,000 HP of electric motors now in use in quarrying, adding that the development of high-speed recording instruments had contributed materially to a full understanding of the electrical problem in the design of equipment to deal with the severity of the duty and the fluctuating nature of the load. Referring to the proposal that a voltage drop of 10 per cent. on service peaks should not be exceeded, he suggested that there would be considerable advantage where it was not necessary to go to 3,300 V, in adopting, say, 650 V, as the percentage voltage drop for equal loads transmitted varied inversely with the square of the voltage for a given size of conductor.

In a British Standard Specification, not yet published, for quarrying trailing cables, four-core pliable armoured cable was provided for in eleven conductor sizes, from 0.01 to 0.20 sq. in. for up to 660 V, and in seven conductor sizes, from 0.0225 to 0.12 sq. in, for 3,300 V.

Was so large a choice of conductor sizes really necessary? It seemed that the practical needs would be served adequately if, say, 25 per cent. or more of the conductor sizes were eliminated. There were, in fact, in the draft Specification no fewer than 44 varieties of 4-core 660 V pliable armoured cable to choose from and 28 varieties of 3,300 V cable of the same description, to mention only the primary design of cable.

Mr. J. R. Cowie (A. Reyrolle & Co., Ltd.) said that tabulated details of 30 cu. yd. and 3½ cu. yd. buckets did not seem to bear proper relation to each other. Why should there only be 500 HP for the large bucket and

125 HP for the smaller? There were many things on the Continent and in America where a different class of machine was used which should some day be described in a sequel to the present paper.

Mr. C. J. Hyde-Trutch (Ruston-Bucyrus, Ltd.), referring to rheostatic control with AC motors, said that the better operating results justified the higher cost, but one of the difficulties had been the endeavour to get a cheap comparison with the steam machine.

The excavating machine was manufactured to give a certain output and the manufacturer must fix ratings accordingly. The purchasers should be careful not to specify conditions without consultation with the manufacturers having regard to the difference between electrical machinery operated under static conditions and under the tremendous vibration and shock that took place with excavators. The constant-current system in its simplified form was designed for the use of a single generator for Diesel-driven machines where there was not room for three generators, and it would be interesting to see after the war how the development of the high-speed engine might lead to the further use of the constant current system in a simplified form.

Regular and Intelligent Maintenance

Mr. J. V. Peacock (London Brick Co.) said that in a decade the electric drive had established itself and proved its suitability. The excavator, probably more than most other electrically driven machines, required regular and intelligent maintenance. He insisted on having a high cab roof so that there could be a permanent system of runway joists equipped with lifting hoists and blocks. This meant extra cost, but it was amply justified.

When synchronous motors were incorporated, a considerable number of flats developed on the slip rings and he wanted advice about that.

Mr. J. Parker (A.P.C.M.), said he doubted if the use of synchronous motors for driving motor-generator sets was altogether justified and asked whether, when they were used, there were any automatic features to control power factor. The necessity for an earthing ring with the collecting gear had not been mentioned, and when selecting a trailing cable consideration should be given, in addition to its mechanical strength, to increased impedance due to the pliable wire armouring, which might be of the order of 3 per cent. Also, consideration should be given to its capability of withstanding the short-circuiting conditions which might occur without destruction. When cables had pliable wire armouring their cradle centre did not serve any useful purpose and might be replaced by a rubber filler core, which would result in considerable saving of rubber.

He specially stressed the importance of maintenance of the controller contracts on excavators. Grease was not a desirable lubricant as it carbonised and acted as an abrasive. Transformer oil had been found effective. To avoid trouble from vibration, a flexible coupling should be fitted between the racking motor and the driven mechanism.

If a quarry operator established a substation and took a supply in bulk from an authorised undertaker the equipment installed in the quarry up to the point of supply by the undertaker came under the Electricity Commissioners' Regulations. But if the substation were fed from the quarry operator's own power station, the equipment came under the Mines Department, as regarded cables. This called for consideration.

Mr. H. G. Brown (London Brick Co.), also discussed maintenance and said that the Ward-Leonard system had the advantage in that practically all maintenance was confined to the controllers.

Mr. H. Sharpe (B.T.H. Co.), dealing with ratings, said that the addition of a blower to a motor subject to overheating increased its rating by about 25 per cent. Motors with Class B insulation operated successfully at considerably higher temperatures than with Class A insulation with smaller physical dimensions and inertia.

The use of a synchronous motor for the main drive, besides providing for power factor improvement, enabled adjustment to be made so that the peak load was taken at unity power factor, thus keeping the peak kVA to the minimum. The constant-current system had the disadvantage that it deprived the electric motor of its overload torque capacity. Against that, however, was the great advantage of a single generator.

Increasing Pull-out Torque

Mr. J. F. Shipley, referring to the conditions under which excavators had to work in certain countries abroad, said that it was very creditable to the manufacturers that machines stood up so well to their work in such circumstances. A great deal of credit was also due to those who maintained them. He asked if it would be possible with induction motor machines to increase the pull-out torque by means of a condenser in two portions, one of which was permanently in circuit with the induction motor and the other in circuit during starting only.

Mr. G. F. Lowe (B.T.H. Co.) remarked that he had hoped the author would have said more about the Austin constant-current system and the (B.T.H.) S.C. scheme in which the current remained substantially constant; it was designed to withstand a greater inertia than the Ward-Leonard system. The author rather tended to tie things down to a motor generator speed of 1,500 RPM, which was not necessary.

Mr. A. Morgan mentioned that there were several rubber substitutes which he regarded as superior to rubber and although the cost was very much higher when used for flexible couplings, there were very great advantages. No reference had been made in the paper to limit switchgear for the rack and the angle or radius of the jib.

The author, in the course of his reply to the discussion, said that Mr. Horsley's suggestion to use 650 V after they had been talking about standardisation for years seemed to be a retrograde step. Concerning the peculiar ratio of power required for 30 and 3½ cu. yd. buckets the rating of the motors had no relation to the capacity of the buckets. A great deal more than that was involved. Users should certainly try to keep their special requirements down to the minimum, particularly at the present time, when it was necessary to consider standardising everything to the very limit; indeed, those remarks also applied to happier times because there were instances in which the manufacturer was able to show the consultant that certain things should not be done, based on the manufacturer's own experience.

As to the suggestions by Mr. Peacock for additional equipment in the cab and elsewhere, it had to be remembered that these machines were made on a commercial basis and there were certain limits to the degree of refinement which could be adopted.

Vibration Damping

THE damping capacity of engineering materials, which enables them to restrict motion by absorbing energy from mechanically vibrating systems, has been surveyed by Dr. W. H. Hatfield and Messrs. G. Stanfield and L. Rotherham (Brown-Firth research laboratories, Sheffield). Their investigations with several steels, a variety of alloys and a few non-metallic substances are described in a paper presented to the NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS at Newcastle-on-Tyne on May 15th.

Their tests have been made with specially contrived electromagnetic apparatus (illustrated and described in some detail in the original paper) which causes deflection to be recorded optically for magnified projection. To enable specimens to be tested at elevated temperatures, a small tube furnace is so incorporated as not to be influenced by the vibration, temperatures being measured by shielded thermocouple. The apparatus appears to offer possibilities as a research weapon in metallurgy.

The accuracy of the method is sufficient to place the damping capacities of various materials in their relative orders and to indicate effects that may be expected in service. Some of the data obtained are in accord with those of previous workers, while some are novel; but comparison is difficult because objects and procedures have differed and results have been expressed in various ways. In experiments of the kind conducted by the present authors it is not possible to distinguish between different contributory influences, so that their results should be chiefly considered as furnishing data upon the magnitude of the effect in a range of engineering materials that should be useful to designers.

Damping and Ferro-Magnetism

Damping values of truly austenitic alloys are relatively small while those of stainless metals are particularly large, steels containing little carbon being of intermediate value. The exceptionally large damping capacity of nickel observed at room temperature is remarkable by comparison with alloys that are non-magnetic. It appears that ferro-magnetic properties are important, but beyond that observation the authors are unable to suggest an explanation of the results obtained. Ferro-magnetism may indeed in some cases be the dominant influence.

Mr. J. Woolman (a colleague of the authors) has pointed out that there is some similarity between graphs representing change of magnetostriction with magnetising field and change of damping capacity with temperature, which suggests a relationship between damping and magnetism, but it is not clear in what way.

I.E.S. Report

REGULAR meetings of the ILLUMINATING ENGINEERING SOCIETY were held during the past session and the Council's report presented at the annual meeting on May 12th recorded a substantial increase in membership (180). The Society now has Centres in Leeds, Manchester, Birmingham, Nottingham and Glasgow and groups in South Wales, the North-Eastern area, Sheffield, Bath, Bristol and Leicester. The North-Eastern area has qualified for the status of a Centre and it is hoped that other groups will similarly qualify.

Steps are being taken to encourage the younger men to become student members, one of which is the institution of a special award for students under the age of 26, irrespective of membership of the Society. It was again possible to hold the examination in illuminating engineering initiated by the City and Guilds of London Institute, although the number of entrants was small. While the income was larger the expenditure rose to a greater extent but there was still a surplus.

The "I.E.S. Code" has been adopted by the Ministries of Supply and Aircraft Produc-

tion and the Admiralty in applying the Factories (Standards of Lighting) Regulations, 1941; a revised version of the Code has recently been issued. A representative committee on Lighting and Reconstruction has been established. Two sub-committees have been formed—technical and legal—and have already carried out useful work. The prospects for the next session appear to be very good.

Following the annual meeting of the Society an address was delivered by Mr. G. H. Wilson, B.Sc. (Eng.) on "Street Lighting, Past, Present and Future."

After reviewing the progress made in recent years, Mr. Wilson considered the possible nature of the street lighting of the future. The fluorescent lamp might find application and there might be new sources, and new materials for reflectors and refractors. But would the technical problems be the main ones? A review of the decade ending in 1938 suggested that our technical resources were enormous and that technical problems were relatively easy to solve.

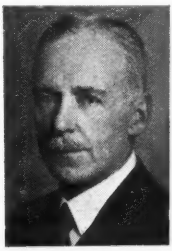
It seemed that the future of street lighting depended on the extent to which the scientific attitude of mind was employed in the application of the achievements of research. Perhaps something could be learned from another activity with which all the members of the community were concerned, that of town planning. Here Coventry had set an example with a new viewpoint arising from an analysis of the unsuccessful experiments of the past. Could not the street lighting of the future be planned on an equally bold scale? It would entail co-operation between local authorities and commercial undertakings, users and suppliers, scientists and salesmen all having but one object, the supply and installation of the most effective lighting for the purpose in hand.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE electrical and allied industries are well represented on the Industrial Panel of thirteen set up by the Minister of Production. The membership includes Mr. G. E. Bailey (Associated Electrical Industries, Ltd.), Mr. E. W. Bussey (Electrical Trades Union), Mr. A. McKinstry (Babcock & Wilcox, Ltd.), Mr. Frank Parkinson (Crompton Parkinson, Ltd.), Mr. T. G. Spencer (Standard Telephones & Cables, Ltd.) and the Hon. J. K. Weir (G. & J. Weir, Ltd.).

Mr. W. T. Halcrow, whose lecture on "Water Power and its Application to the Production of Metals" before the Institute of Metals is dealt with on another page, is senior partner in the firm of W. T. Halcrow & Partners. In his earlier years he was principally engaged in dock, harbour and railway construction at home and abroad and has since carried out a good deal of hydro-electric work, including the Kinlochleven and Lochaber schemes. He is consulting engineer for the Caledonian and Grampian developments. Mr. Halcrow is a member of the Council of the Institution of Civil Engineers and colonel, Engineer and Railway Staff Corps, R.E. (T.A.).



Mr. W. T. Halcrow

We regret to learn that **Mr. Arnold H. Gridley**, son of Sir Arnold Gridley, who is in the Malayan Civil Service, has not been heard of since February 5th, when he was in Singapore.

Mr. V. Watlington, director of the British Electrical & Allied Manufacturers' Association, is a member of the Central Committee of Export Groups appointed by the President of the Board of Trade.

Dr. C. G. Darwin, M.C., F.R.S., director of the National Physical Laboratory, has been appointed scientific adviser to the Army Council. He is also joining the Scientific Advisory Committee of the Ministry of Supply.

Sir Felix Pole has been re-elected president of the Electric Vehicle Association of Great Britain, Mr. A. W. Barham is chairman, Mr. A. J. Fippard, vice-chairman; Mr. H. M. Drake, hon. treasurer and Mr. A. C. Cramb, secretary.

Mr. P. Lazarus, divisional engineer (Vizagapatam) with the Government of Madras Electricity Department, has been awarded the first commendation for devotion to duty during air-raids in India. For sixteen hours he kept the electricity supply at Vizagapatam in operation with the aid of only one assistant.

Mr. R. O. Ackerley (G.E.C.) is the new president of the Illuminating Engineering Society. Dr. H. Buckley and Mr. E. J. Stewart continue in office as vice-presidents and Mr. E. Stroud has been elected a vice-president. Mr. J. S. Dow is still hon. secretary; Mr. H. C. Weston succeeds Mr. E. W. Murray as hon. treasurer.

The following nominations have been made by the various Section Committees of the Institution of Electrical Engineers to fill vacancies which will occur on their committees on September 30th :—Installations Section: Chairman, Mr. R. Grierson (Northmet Power Co.); vice-chairman, Mr. A. G. Ramsey (Ministry of Works and Buildings). Meter and Instrument Section: Chairman, Mr. E. H. Miller (Sangamo Weston, Ltd.); vice-chairman, Mr. E. W. Moss (Raworth, Moss & Cook). Transmission Section: Chairman, Mr. P. E. Rycroft; vice-chairman, Mr. T. R. Scott (Standard Telephones

& Cables, Ltd.). Wireless Section: Chairman, Mr. R. L. Smith-Rose (National Physical Laboratory); vice-chairman, Mr. H. L. Kirke (British Broadcasting Corporation).

Mr. S. Ferguson has resigned his position of managing director of Ferguson, Pailin, Ltd. His address is c/o Cooke & Ferguson, Ltd., Victoria St., Manchester, 11, of which company he is a director.

Mr. L. H. A. Carr, M.Sc.Tech., M.I.E.E., has been elected chairman of the North-Western Centre of the Institution of Electrical Engineers for the 1942-43 session. The Committee of the North Midland Students' Section has nominated **Mr. R. J. Griffiths** as chairman for next session.

Mr. John M. Brooke, M.I.Mech.E. has been appointed director and general manager of Venner Time Switches, Ltd., in succession to Mr. G. B. G. Potter, who has been holding the position temporarily.

Mr. B. Clayton, late of Clayton Bros., Salisbury, has joined the board of directors of Powell & Lee, Ltd., 230, Vauxhall Bridge Road, Westminster, S.W.1.

Mr. H. Frankland, who has for many years been with Edison Swan Cables, Ltd., has left the company to take up the appointment of general manager to Rotunda, Ltd.

At the annual general meeting of the Electrical Contractors' Association of Scotland, Ayrshire Branch, held at Kilmarnock, **Mr. Alexander McAuslan** was elected chairman. Mr. McAuslan was wounded in the last war and, on leaving hospital, started in business on his own account in Irvine, Ayrshire, and has carried out many important contracts throughout the country. He served his apprenticeship with Claude Hamilton, Ltd., Glasgow.

Miss L. Wallis, chief chemist to Edmundsons Electricity Corporation, Ltd., recently became the first woman member of the Electrical Power Engineers' Association (Class J, Grade 7). Miss Wallis was a student at Armstrong College, Newcastle-on-Tyne, and graduated at Durham University, later receiving the M.Sc. degree for a dissertation on coal testing. For fifteen years she was in charge of the Elswick Laboratory of the Newcastle and Gateshead Gas Co., and then became chief chemist to the South-Western Gas and Water Corporation. She has been with Edmundsons for about a year.

Obituary

Mr. H. Faraday Proctor.—We regret to report the death, last week, of Mr. H. Faraday Proctor at the age of seventy-five. Mr. Faraday Proctor occupied a prominent position in the electricity supply industry from its early days and was city electrical engineer of Bristol for about forty years, retiring ten years ago.

Mr. John Miller, Director of Aircraft Production (Factories), who died on May 16th, retired from the post of chief engineer to the north-eastern area of the L.N.E.R. in 1937. He was responsible for the installation of colour-light signalling over the York to Northallerton section, and the electrification of the Newcastle-South Shields branch.

Mr. J. Fraser.—We regret to record the death, at his home at Mill Hill on May 7th, of Mr. James Fraser. Mr. Fraser was in his eighty-seventh year, and had been a director of the General Electric Co., Ltd., since 1919.

Dr. L. C. Stoney.—We report with regret the death, at the age of eighty, of Dr. George Gerald Stoney who was well-known for his work on the steam turbine with C. A. Parsons & Co., Ltd. Dr. Stoney was born in Dublin and educated at Trinity College. He joined Parsons as an apprentice in 1888, and eventually became technical manager. In 1912 he commenced a consulting practice and up to 1917 was engaged in national work. He was appointed Professor of Mechanical Engineering at the Manchester College of Technology in 1917 and held that post until 1926 when he returned to Parsons as director of research, retiring in 1930. Dr. Stoney was a D.Sc. of Durham University, a Fellow of the Royal Society and a member of the three premier engineering institutions.

Mr. A. P. Boden.—We regret to record the death of Mr. A. P. Boden, A.M.I.E.E., chief works engineer, at Hayes, of Electric & Musical Industries, Ltd., which occurred on May 12th in his fifty-eighth year. Mr. Boden joined the Gramophone Co. in 1913, and was previously with the L.C.C. Tramways Department. At Hayes he planned and built for present needs and future possibilities the buildings, services, process plant and power supply over a period which saw a great deal of expansion, including the absorption at Hayes of the radio manufacture of the Marconiphone and Sterling Companies at Dagenham, and also the manufactures of the Columbia Co. following the merger of the two companies into Electric & Musical Industries. Later the Rudge-Whitworth business was taken over and a new factory built and equipped at Hayes. Mr. Boden leaves a widow, two sons and a daughter.

The late Mr. A. P. Boden

Mr. J. W. Hartley.—The death is announced of Mr. John William Hartley, formerly chairman of Hartley's (Stoke-on-Trent), Ltd., engineers. He died at Stone, Staffs, at the age of ninety-six. From 1890 to 1895 Mr. Hartley was manager of the Kilmarnock works of Dick Kerr & Co., Ltd. He was responsible for many inventions and improvements in engineering plant, and had taken out more than 120 patents.

Mr. H. R. Heys.—The death is announced of Mr. Henry R. Heys, Oldhall, Renfrewshire, Scottish agent for T.M.C.-Harwell (Sales), Ltd. He was fifty-seven years of age.

Mr. R. H. Green.—The death is reported from Sydney, N.S.W., after an operation, of Mr. Ronald H. Green, director of the English Electric Export Co., Ltd.

Mr. W. N. Chamberlain.—The death, on active service near Mandalay, is reported of Sgt. Walter Newton Chamberlain (R.E.). at the age of thirty-two. He was an electrical engineer with the Burma Corporation.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Reclaiming Rubber

I HAVE read with interest the article on "Reclaiming Rubber" in your May 1st issue. Experience at these works does not agree with the remarks regarding violent fluctuations of load, as when a refiner or leafing machine is once tightened up and the bank in the nip is maintained, one of the steadiest loads in the rubber trade results. In fact records taken on a number of our 400-HP motors driving batteries of refiners show practically a straight line load. In the cracking operation, however, where the initial breaking down of tyres takes place, the 400-HP machine is subjected to very heavy fluctuating loads and it occurs to us that the two processes may have been confused.

The method of solenoid-operated brake for emergency stopping has been used for many years. Our practice, however, on motors of 250 HP upwards, is to use dynamic braking in conjunction with synchronous induction motors, resulting in more rapid stopping than the former method.

RUBBER REGENERATING CO., LTD.
Manchester. L. A. WHITE, *Chief Engineer.*

Scarcity of Timber for Cable Drums

ABOUT a year ago you kindly published a letter in which I referred to the great difficulty experienced in obtaining supplies of timber for the construction of cable drums, and appealed to all cable purchasers to help to ease the position by returning empty drums and battens to their suppliers as promptly as possible. The appeal appeared to produce an appreciable acceleration in the return of drums but more recently the position has worsened.

It is recognised that a great many drums are necessarily used for the storage of cables held as emergency spares but it seems likely that, at the present stage of the war, this "static" requirement has for the most part been met, and one would have expected that the inflow of returned empty drums would have gone far towards meeting requirements for the dispatch of new cables. This, however, is far from being the case. Although in present circumstances the supply of cables is strictly limited to purposes officially approved as of national importance, and the amount of exported cable is small, some of the larger cable-making firms, while making full and prompt use of returned drums, are finding it necessary to make new drums at the rate of 12,000 or more per year in order to fulfil their own contracts. The heavy demand thus made on the country's limited supplies of timber is a matter of serious concern to the Timber Controller.

Existing transport difficulties necessarily involve occasional delay in handling returned empties at some points, but all the railway companies are co-operating in the expeditious return of empty cable drums and I have their assurance that whenever and wherever it is found necessary for essential reasons to place a temporary local embargo on their acceptance the embargo will be lifted at the earliest possible moment.

It is felt that if the great body of cable purchasers throughout the country will, in the national interest, make continuous efforts to secure the rapid clearance of cables, and the return of the empty drums, considerable improvement will result.

*London, W.C.*1. T. F. PURVES,
Director, CABLE MAKERS' ASSOCIATION.

Absence from Work

REFERRING to the article by Mr. Gosden in your issue of May 8th, I can fully endorse everything that he says as to the causes of absenteeism. Last week in our works the total lost time was 2.819 per cent. of the total man-hours worked, but the actual time lost in being late in the morning on quarters and half hours was only .119 per cent. The difference was made up by comparatively large periods of absence, like a day or half a day, mostly of married women.

We have in this works a tradition for good time-keeping, but we give several incentives; they are as follows :—

1. After six months' service an employee is entitled to two weeks free pay (for holidays) in the course of 12 months, from which is deducted all time lost.

2. The employee of 18 or over, who keeps perfect time for 12 months, thereafter has a weekly wage and it is only if he then loses a considerable amount of time that he is returned to hourly pay. This is probably more appreciated than anything, as it covers odd time off for sickness, and all holidays, with the exception of the August holiday.

3. We have what we call a "prosperity bonus," which is a weekly bonus depending upon the output of the whole works and for a married man or woman it amounts to as much as 12s. per week. Anybody losing half-an-hour in the course of a week loses his output bonus for that week. The bonus, at the request of the workers, is not distributed weekly, but paid out in a lump sum every six months.

*London, E.*17. MANUFACTURER.

Lubrication and Bearings

Reducing the Number of Failures

By H. Greaves

FAILURES of cage motors are more often due to mechanical than to electrical defects. Ultimate breakdown of a motor from electrical trouble may actually have originated in bearing failure, and in order to minimise the consequent loss of production, attention to bearings and lubrication must be considered as an essential feature of plant maintenance.

In many works a squad of men is engaged on oiling and greasing machinery and repairing belts. They may include the electric motor in their sphere of activity, but its lubrication is not always carried out according to a preconceived plan. As a result, motors which are easy of access are persistently over-lubricated, much harm being done to bearings and windings, but motors which are built into machines are probably left for a more convenient time and as a result are forgotten.

The author is concerned with the maintenance of several thousand motors and has found the system referred to most useful in reducing the number of bearing failures

I would suggest that the work of bearing inspection should be the prerogative of the electrical engineer and that the men employed on these duties should be trained to know when a machine is ready for lubrication. They should be able to detect a bearing which requires renewing and be conversant with the physical properties of the different grades of oils and greases. Thus the job calls for the employment of men with intelligence, and the rate of pay should be commensurate with the responsibilities.

Principal Types

Of the three main types of bearings, sleeve, ball and roller, the first has the advantage of silent operation, but the other two are more likely to be met with in modern practice. In the sleeve bearing, which has evolved from a hole drilled in a solid block of metal, wear due to friction takes place in metal (*e.g.*, gunmetal or white metal) that is softer than the shaft.

Under working conditions the shaft tends to climb the bearing in a direction opposite to that of rotation, carrying with it oil which maintains a film between the shaft and the bearing at the point where actual contact would be made if no oil were present. Therefore the most important point is to maintain sufficient speed to hold the oil film, for as the load increases a higher speed will be required, and if the speed is allowed to fall, frictional wear will take place.

The sleeve bearing is cheaper than either of the other two, but initial expenditure is no criterion of ultimate cost which must be calculated on the normal life of the bearing. On a five-year basis the ball bearing will generally show a saving of 10 per cent. over the sleeve bearing when the cost of oil and grease are taken into consideration.

The principle of the ball bearing is different. Its working life depends largely upon environment and under ideal conditions should be at least twenty years. Lubrication is applied for two reasons: to keep the balls clean and free from rust and to reduce the working temperature. The action of such a bearing is rather like a wheel on a flat surface, although the contact may be called a point contact to distinguish it from the line contact of the roller bearing.

The balls or rollers are maintained at the correct pitch by means of a cage and, due to variation in size which may only be microscopic, there is a slight amount of friction between the balls and the cage. In the unloaded state the contact is merely a point contact incapable of sustaining load, but when load is applied there is a possibility of circular flats developing which produce additional friction; hence the need for lubrication.

The following factors affect the life of such a bearing: correct type and proper application of the lubricant; prevention of grit and moisture entering the housing; defective balance in motor and pulley; excessive temperature, which upsets the inherent clearances and prevents proper lubrication.

With factories now working day and night, the life of a bearing is bound to be affected by conditions equivalent to three years' working in one, so that the neglect of the first item will materially shorten the bearing's life.

Finally, the same class of grease is not always suitable for use all the year round, owing to variations in ambient temperature. High melting point grease, for example, will be required for unit-heater motors working in close proximity to steam coils. The oiler should enter on a block pad of forms particulars of machines visited, stating where any motor is inaccessible so that arrangements can be made to stop the machine at the first opportunity and noting any motors with missing lubricators so that these can be fitted without delay.

COMMERCE and INDUSTRY

Engineering Unions Co-operate. Ban on Display Lighting.

Electric Vehicle Standardisation

At the annual meeting of the Electric Vehicle Association of Great Britain it was reported that the control of materials, which had previously been in the hands of the Ministry of War Transport, had been transferred to the Ministry of Supply. A number of electric vehicle manufacturers had recently met the Ministry of Supply, when the question of standardisation was stressed, and the manufacturers agreed to investigate the full question of closer collaboration to meet the Ministry's views. During the year the Association had appointed a Standardisation Sub-Committee and progress had been made.

Since the annual meeting, the Electric Vehicle Manufacturers' Sub-Committee has decided to meet and study the problem of standardisation to conform with the desire of the Ministry of Supply. Regular weekly meetings of this committee are being held.

Engineering Workers' Organisation

Commenting upon statements which have appeared in the daily Press that a move was on foot to create a large union embracing all workers in the engineering and allied industries, the May *A.E.U. Monthly Journal* says that the matter has been greatly exaggerated. The statements arose out of the appointment of a subcommittee at a meeting in April of representatives of the Amalgamated Engineering Union, the Confederation of Shipbuilding and Engineering Unions and the National Union of Foundry Workers to draft proposals for the re-creation of the Engineering Joint Trades Movement. The proposals have been drafted and the matter is still under consideration.

This and other decisions recently taken with regard to the establishment of Joint District Trade Union Production Committees and of a National Advisory Committee for the engineering and allied unions are said to be essentially practical developments in inter-union relations arising out of wartime conditions. "In so far as they bring the numerous unions in these trades closer together they do pave the way and perhaps lay the foundations of one great union in these trades."

Companies' Annual Returns

An Order in Council amending the Defence (Companies) Regulations, 1940, published under Statutory Rules and Orders, 1942, No. 803 relieves public companies from the obligation to include in their annual returns, commencing with the return due this year, the information required by the Companies Act as to present and past members of the company and the stock and shares held or transferred by them. The Order does not apply to the first annual return of any company or to any annual return of a private company. In these cases the full return as required by the Companies Act must still be made. The Order also provides for the same protection to companies destroying cancelled share and stock certificates as was given by Regulation 7 of the Defence (Companies) Regulations (Statutory Rules and Orders, 1941, No. 1778) in the case of share or stock transfer deeds. In addition, it widens the application of Regulation 7 by extending it to companies and transfer documents not previously included.

Advertisement Lighting Restrictions

A new Board of Trade Order, entitled the Advertisement Lighting (Restriction) Order, 1942, which came into force on May 18th, prohibits the use at any time of lighting fittings or other appliances whereby electricity, gas or other illuminant substance is consumed for advertisement purposes inside any premises unless it is proved that the use of such fittings or appliances is either (1) reasonably necessary for the purpose of serving the public and is still being used only during the time the premises are open to the public or (2) is only such display of light as is described in Part IV of the Lighting (Restriction) Order, 1940, which permits, subject to specified conditions, certain illuminated signs in shops, residential hotels and places of entertainment.

Surplus Metal Stock List

To speed up the output of war materials the Ministry of Supply is now issuing a monthly stock list in which details of surplus stocks of ferrous and non-ferrous metals are published. Those engaged on work of national importance can thus ascertain what quantities of surplus processed raw materials are available. Holders of surplus stocks should report particulars to the Directorate of Economy (Disposals) Steel House, Tothill Street, London, S.W.1. The stock list does not include surplus aircraft material, which will continue to be dealt with by the Ministry of Aircraft Production.

Lectures on Canteen Management

For the benefit of those who are running industrial canteens, British Restaurants, etc., course of lectures on canteen management and administration have been arranged by the Ministry of Labour and National Service in conjunction with the Board of Education and the Scottish Education Department. The course of twelve lectures will be held outside ordinary working hours and as far as possible both time and place will be arranged to suit the convenience of those who attend. Employers are invited to give the Ministry of Labour and National Service, the names of staff they would like to send to these lectures, which are free. Applicants not nominated by an employer may also attend if their work is closely connected with canteens. Applications may be made to any Employment Exchange, but firms in the London Region should preferably apply to the Regional Controller (R.O.5), Ministry of Labour and National Service, Hanway House, Red Lion Square, W.C.1 (telephone: Holborn 8454: Extension 104).

Government training courses for canteen

cooks have now been running for some time, and there is a steady flow of trainees into canteens, British Restaurants, etc. Employers who wish to engage canteen cooks from these classes should get into touch with their local Employment Exchange.

Drawing-Office Instruments

The urgent need for drawing instruments and engineers' slide rules in the drawing offices of armament factories has resulted in a demand far in excess of supply. To alleviate the position it is hoped that owners of such instruments in good condition, who at present have no use for them, will be prepared to offer them for sale to members of the Drawing Office Material Manufacturers' and Dealers' Association, 24, Windsor House, Victoria Street, London, S.W.1.

Saving Tungsten Steel

Recent Orders made by the Ministry of Supply have aimed at economising in the use of tungsten steel in tools and at salvaging all steel parts containing tungsten. In this connection Wild-Barfield Electric Furnaces, Ltd., remind us that the Spekker "Steeloscope," of which they are distributors, enables the presence of tungsten in steel to be detected immediately and so avoids the costly and tedious necessity of sorting by chemical means.

Sequel to New Zealand Fire

The *New Zealand Electrical Journal* reports that a writ against the Auckland Electric Power Board claiming £225,188 damages has been issued on behalf of John Burns & Co., Ltd., at whose premises extensive destruction was caused by a fire in August last year. Diverse breaches of statutory duty are alleged, including failure of the Board to fulfil its statutory obligations as set out in the respective regulations concerning electrical installations. A further writ has been issued against both John Burns & Co. and the Power Board on behalf of the widow of a man who received fatal injuries in the fire. In this it is alleged that the fire was caused by a short-circuit and that this occurred through a breach by the Power Board and John Burns & Co. of their statutory duties; it is also alleged that the latter were guilty of negligence.

Accident Due to Defective Flex

In the King's Bench Division last week Mr. Justice Oliver had before him an action by John Frederick Smith, aged eighteen (suing by his father) against the Roco-Epeda Co., Ltd., to recover damages for personal injuries and consequential loss.

It was stated that defendants were the owners of factory premises at Moor Lane, Colnbrook, where plaintiff was employed as a machine assistant. Part of the premises consisted of a room down the side of which ran an iron hot water pipe. There was an electric iron connected to a flex which ran from the wall near the pipe and part of the bare flex had got twisted round the pipe. On December 22nd, 1939, plaintiff put his right hand on the pipe and was severely burned, the pipe being charged with electricity.

Defendants alleged contributory negligence on the part of plaintiff. They claimed that he negligently touched the pipe, that at the time of the accident he was not acting in the scope of his employment, and that he had meddled with the iron and flex.

His Lordship, in giving judgment, said that the regulations laid it down that any such flex should be protected. Here the flex was bare, defective and damaged, and it was quite wrong to put it round the water pipe. How, in the face of the regulations, could defendants claim that plaintiff brought the accident on himself by his own negligence? Plaintiff went to warm his hands and the danger was not apparent; he had been severely crippled and had lost half the value of his right hand. His lordship awarded plaintiff £800 general damages plus £191 special damages, and £18 to the father, with costs.

Winchester Joins J.I.C.

The Winchester City Council has become a member of the No. 11 District Joint Industrial Council (South Coast Area), Electricity Supply Industry and of the National Joint Industrial Council for the industry. The Council's undertaking has been placed in Zone B of the schedule.

Welding Apparatus Exports

In view of the heavy demand in the United Kingdom for welding machines and parts, the Machine Tool Control has had under review the position in regard to manufacture for export. In order to avoid disappointment to overseas customers by acceptance of an order for which a licence is not ultimately granted it is proposed to intimate at an early stage whether export would be permitted. Manufacturers are accordingly asked to submit all export inquiries or orders to the Machine Tool Control (Department D.I.E.E.), giving full particulars. The above arrangements do not modify any special procedure in force in connection with inquiries or orders for the U.S.S.R.

Australian Import Restrictions Removed

Restriction on the importation into Australia of the following goods from sterling areas have now been removed: Handset telephones, n.e.i., bell sets for telephones, parts, n.e.i., of handset telephones and of bell sets for telephones; keys (including radio); magneto bells and parts therefor, whether imported separately or mounted with a key or switch; indicators or drops with or without shutters; relays; bell coils; impedance and resistance coils and spools; lamp sockets for switchboards; protective apparatus; cable boxes unprotected; devices for junctioning telephone and telegraph wires and cables; ear caps and mouthpieces; switchboards; and jacks.

Salvage Exhibition

Though concerned principally with salvage, an exhibition arranged last week by Kodak, Ltd., also dealt largely with methods of avoiding waste. Useful suggestions, most of them obvious when pointed out but by no means generally appreciated, were given to show how the amount of paper used for stationery, packing, etc., could be reduced to the minimum, and there was a special section demonstrating how materials rejected in course of manufacture could be utilised. Film reels gave some idea of the stage to which the company has developed its salvaging scheme.

The recovery of silver from the photographic

fixing solutions and the reclaiming of rubber also formed an interesting study, while the great importance of bones was emphasised by indicating the various materials derived from them.

Articles made from scrap paper included several used in warfare. Suggestions for avoiding waste and assisting salvage are invited by the company and some of the entries for a slogan competition were on view.

Wartime Regulations

It has been found necessary to issue a second supplement to the "Summary of the Emergency Statutes, Regulations and Orders affecting the Electricity Supply Industry," which was published toward the end of last year. The first supplement appeared in February. This brings the matter up to April 30th and the practice has been continued of numbering the pages from the last supplement and giving a complete index to the three publications. The supplement (compiled by Messrs. Leslie Gordon and J. W. Simpson, assisted by Messrs. F. Newey and G. D. Helliwell) is obtainable from Mr. Simpson at the I.M.E.A. headquarters, Wellington House, 125-130, Strand, W.C.2.

Export Control Extended

Under the Export of Goods (Control) (No. 22) Order, 1942 (S.R. & O. 1942, No. 783), which came into force on May 19th, licences will in future be required to export goods of every description to Spain (including the Canary Islands and the Spanish Zone of Morocco), Portugal (including Madeira, the Azores and the Cape Verde Islands), Turkey (including the Hatay), Iraq, Tangier Zone, Liberia, Portuguese Guinea, Andorra, Rio de Oro and to any port or destination in the U.S.S.R.

Brazil's Electrical Imports

According to the *Bulletin* of the Brazilian Federal Council of Foreign Trade, the imports of electric generators and motors into Brazil last year reached a total of 2,172 tons as compared with 1,517 tons in 1940. There was also an increase in imports of electrical fittings, instruments, etc., from 4,765 to 6,403 tons.

Indian Import Restrictions

The *Board of Trade Journal* gives further additions to the list of apparatus affected by import restrictions. They include various types of motors, generators, transformers, condensers, switch and fuse gear, insulators, instruments, cables, accessories and welding electrodes.

The Argentine Electrical Industry

In an article on industrial employment in Argentina, the *Review of the River Plate* states that the country's electrical industry has shown varied evidence of expansion and a considerable widening of its range of production during the past three years. Transformers for power stations and general industrial use are now being manufactured in the Republic, as also are certain types for wireless transmission purposes.

Fatality

A verdict of "Accidental death" was returned at an inquest last week on Joseph William Sanders (40), an employee of Worksop Electricity Department. It was stated that he was standing on a ladder creosoting a pole over which ran an electric wire which he must have touched at the very time that it was momentarily made "live." The shock made him fall and he died from a fractured skull. He had previously worn a safety belt when creosoting another pole but had left it off. Mr. J. Shillitoe, mains foreman, said that he was on his way to fetch the men from work and knowing that they had usually "knocked off" by that time, he put two fuses in at a nearby box, but withdrew them almost immediately. In recording the verdict the coroner commented on the risk taken by Sanders in not wearing a safety belt.

Industrial Truck Manufacturers

The Industrial Truck Manufacturers' Association has recently been formed by manufacturers of power-operated industrial works trucks, tractors or trailers and ancillary equipment primarily for internal works use. It will form a medium through which Government departments can consult the industry. The Association will deal with technical and other matters aimed not only at reaching the maximum of efficiency in production of industrial trucks, but also at bringing to the notice of industry in general the extent to which trucks can be utilised to expedite production and release labour for more important work.

The affairs of the Association will be conducted through the secretaries, Peat, Marwick, Mitchell & Co., York Mansion, 94-98, Petty France, Westminster, S.W.1, and the following are members:—Abtus, Ltd.; Aero Engines, Ltd.; Douglas (Kingswood), Ltd.; Bretts Patent Lifter Co., Ltd.; Brush Electrical Engineering Co., Ltd.; Cleco Electric Industries, Ltd.; Electricars, Ltd.; Greenwood & Batley, Ltd.; Lansing, Bagnall & Co., Ltd.; R. A. Lister & Co., Ltd.; Mercury Truck & Tractor Co., Ltd.; Ransomes, Sims & Jefferies, Ltd.; Victor Electrics, Ltd.; Wingrove & Rogers, Ltd.; and Yale & Towne Manufacturing Co.

Change of Name

The name of Wholesale Electrical Accessories (Slough), Ltd., has been changed to J. D. Halliday, Ltd.

Lectures on Russia

MANY aspects of life and work in Russia are to be dealt with in a series of lecture-discussions arranged by the Anglo-Soviet Public Relations Association, 30, Maiden Lane, London, W.C.2. The first three are at the Royal Institution, Albemarle Street, W.1. On June 10th, Mr. Maurice Dobb will speak on "Soviet Planning"; on June 17th, Dr. A. P. M. Fleming on "Engineering in the Soviet Union"; and on June 24th, Sir John Russell on "Russia's Changing Farms and Farmers." The latter part of the series will take place at the London School of Hygiene, Keppel Street, W.C.1, on June 30th, and July 7th, 14th and 21st, when the subjects will be the Russian armed forces, the historical background of the U.S.S.R., Anglo-Soviet trade relationships and nationalities in the Soviet Union.

The charge for the first series is 4s. 6d. and for the second 5s. 6d. or 2s. for each individual lecture.

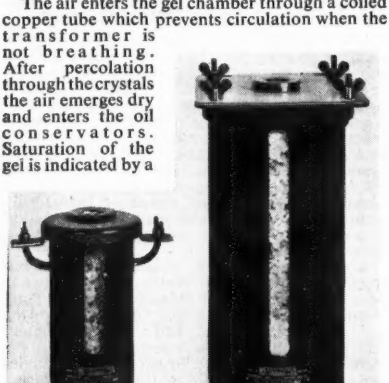
RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Transformer Dehydrator

THE latest form of breather containing silica gel for dehydrating air as it is drawn into the oil conservators attached to transformer tanks as the latter cool down is a simple device needing little attention and is made by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17.

The air enters the gel chamber through a coiled copper tube which prevents circulation when the transformer is not breathing. After percolation through the crystals the air emerges dry and enters the oil conservators. Saturation of the gel is indicated by a change of tint of the crystals from blue to pink, visible through a window in the casing. Quarterly inspection is generally sufficient. The absorbent qualities and blue colour of the silica gel are restored by heating for two or three hours at about 200 deg. C.



Silica gel dehydrating breathers for transformers

Factory Switchgear

Oil-break switchgear of the horizontal draw-out design for industrial use at up to 600 V is now offered by J. G. STATTER & CO., LTD., 82, Victoria Street, Westminster, London, S.W.1, as an alternative to its vertical draw-out ironclad range.

Individual breakers, complete with isolating chamber, can be supplied loose for incorporation in customers' own switchboards; they can be mounted on any flat panel. They are of orthodox pattern with complete enclosure of contacts when in the isolated position and the usual interlocks are provided. All sizes have two breaks per phase and free-handle operating mechanism with the customary protective releases.

Breakers up to 400 A capacity can be mounted in space-saving double tier formation on the front of panels, behind which the busbars and connections are accommodated in shallow sheet steel cubicles. The bolted-on back sheets are readily removable for access and the bottoms are left open for the entry of cables directly from below.

For extensible switchboard assemblies each oil breaker is mounted on its own section of busbars and connection chamber and is furnished with a set of floor pedestals, all completely wired for busbar connection with fish plates.

Laminated Plastics

A development in laminated plastics, which has recently been carried out by H. SCHOLEY & CO., LTD., 6, Woods Mews, Park Lane, London, W.1, consists in moulding sheet material into cases and boxes which, combining rigidity with elasticity, are substantial enough to take switches, recording mechanisms, fuses and instruments. Synthetic resin is used as the binding medium and the B.S.S. requirements are said to be more than fulfilled, the designers having in view conditions that have arisen in aeronautics and radio work.

The material differs from similar products in the way in which the paper fibre and fabrics are combined with a view to eliminating the weaknesses of individual components. It is claimed that the boxes, being without joints, are oil- and water-tight, that they will not "delaminate" in either arctic or tropical climates and that they can be used in chemical, damp or heated atmospheres. The boxes can be readily tapped and drilled and as they are made of a high-grade insulator, metal parts can be screwed direct to the bottom or sides. Several types are available, *e.g.*, for unusually high temperatures or for meeting tracking conditions. They can be supplied of varying thickness in black, grey or brown with either a matt or polished finish.

A further application of combined material, in this case wood veneers or fibre, is for noiseless gears and pinions. An instance is cited in which the useful life was twenty-two months as against one month for the fibre pinion which it replaced.

Switch box made from laminated plastic material

The tensile strength of the material is stated to reach 20 tons per sq. in. with comparable shearing strength and resistance to compression.

ELECTRICITY SUPPLY

Mid-Lancs Board Reprieved. Restrictions in Eire.

Corby (Northants).—STREET LIGHTING.—The question of installing "starlighting" in the streets of the town has been referred back to the Streets and Buildings Committee of the Urban Distric Council.

Glasgow.—EQUIPMENT FOR GAS PLANT.—The Gas Committee is to purchase, through the Electricity Department, a set of control gear costing approximately £240 for the overhead coke cranes. The Committee is also to arrange with Bairds & Scottish Steel, Ltd., for the installation of cable, transformer and switches, costing about £1,200, to provide electric power from its works to the site of the gas compressors. This is in connection with the supply of gas from Bairds & Scottish Steel, Ltd., and the erection of purifiers and a gasholder at the works.

MAINS EXTENSIONS.—The Electricity Committee proposes to lay distributing mains at a cost of £2,698.

Harrogate.—MAINS.—The Town Council has been recommended to apply for sanction to borrow £3,000 for mains extensions.

Hove.—MINIMUM CHARGE REDUCED.—To assist consumers in curtailing electricity consumption the Electricity Committee has recommended the Council to reduce the minimum charge from 5s. to 2s. 6d. a quarter.

Leigh.—CLOSING OF GENERATING STATION.—Protests were made at a Council meeting against the compulsory closing of the local generating plant on the ground of fuel economy. The question was asked why the municipal undertaking should be shut down when there was no interference with a big private company undertaking. The chairman of the Electricity Committee said that the Corporation would not suffer financially and no one would be put out of work. The closing of the plant until at least October would enable a complete overhaul to be effected.

Mid-Lancashire.—ADVISORY BOARD TO REMAIN.—The Electricity Commissioners are not proceeding further for the present with the proposed Mid-Lancashire Electricity Amendment Draft Order, providing for the dissolution of the Mid-Lancashire Electricity Advisory Board. This was the subject of a public inquiry in March, when the Order was apposed by a number of authorities, including Burnley, Bacup, Clitheroe, Haslingden, Darwen, Fleetwood, Accrington and Rawtenstall. The town clerk of Preston then said that most of the constituent authorities thought the Board was redundant, and the deputy town clerk of Blackburn recalled that his Council had long pressed for the disestablishment of the Board. At a recent meeting of the Fleetwood Council the town clerk reported the receipt of a letter from the Electricity Commissioners stating that the Board would not be dispensed with at present.

Stretford.—METHOD OF SHELTER HEATING.—The borough engineer recently reported to the Emergency Committee on discussions regarding the type of heating to be installed in communal shelters at Trafford Park and stated that the Ministry was now pressing for solid fuel stoves in preference to electric heating. If the suggestion were adopted, these particular shelters would be the only ones in the town heated otherwise than by electricity. It was decided to press for the adoption of electric heating.

Thurrock.—INCREASED DISCOUNT.—In view of the surplus on the past year's working of the Electricity Department it has been decided to raise the prompt-payment discount from 2½ to 5 per cent.

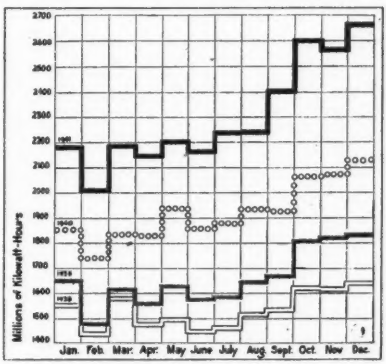
Tynemouth.—CABLE DIVERSION.—The Town Council is considering a proposal to divert the electricity cables in the New Dotwick Street area, at a cost of £1,350.

Watford.—RATE RELIEF POLICY.—A recommendation that the practice of contributing to the rate fund, on the present basis, out of the profits of the electricity undertaking, should cease as from March 31st last, has been made by the Electricity Committee. The Committee proposes that a sum shall be charged annually to the electricity undertaking and paid to the rate fund as representing the cost of administration and establishment charges for services rendered by departments of the Corporation other than the Electricity Department. Further, that a sum equivalent to £⅛ per cent. of the outstanding loan debt as at March 31st in each financial year shall be applied from the net surplus to the rate fund, this being the estimated amount by which the electricity undertaking benefits by reason of the fact that the capital sums borrowed by the undertaking form a charge on the general rate fund.

Wolverhampton.—NEW FEEDER.—The Corporation Electricity Committee is to lay a new feeder cable at a cost of £4,879.

Overseas

Canada.—GROWTH IN PRIMARY POWER CONSUMPTION.—The accompanying graph reproduced from *Electrical News & Engineering*



Graph showing monthly fluctuations in Canadian primary power consumption

(Toronto) shows the sharp increase in primary power consumption last year. Part of this was obtained by the withdrawal of secondary power sold for steam purposes, particularly to the pulp and paper industry.

WATER-POWER RESOURCES REVIEW.—The Dominion Water and Power Bureau of the Department of Mines and Resources of Canada in its annual review published in March, states that the present recorded water-power resources of the Dominion amount to 20,347,400 HP under conditions of ordinary minimum flow and 33,617,000 HP ordinarily available for six months of the year which corresponds to a potential turbine installation of about 43,700,000 HP. The total turbine installation at January 1st, was 8,845,038 HP, new installations during 1941 totalling 254,000 HP.

Eire.—ELECTRICITY RATIONING.—It was announced last week that the Electricity Supply Board had assumed powers to ration electricity and the first restrictions were to be made in a few days. Owing to coal scarcity, various curtailments of electricity consumption would be unavoidable.

DISCOURAGING INCREASED SUMMER CONSUMPTION.—Between May and September last year 26 million kWh was consumed for domestic purposes apart from water-heating, which added a further 8.5 million kWh. Thus the total domestic consumption was 34.5 million kWh (out of 93 million kWh sold for all purposes), or the equivalent of 40,000 tons of coal. In the five months referred to water-heating consumption increased by 50 per cent. compared with the corresponding period of the previous year, while the growth in domestic consumption, including water-heating, was 27 per cent.

In view of these facts the Electricity Supply Board has decided that it is necessary to discourage any further increase in such consumption this year, and indeed to obtain a substantial reduction. The Board has accordingly announced the suspension of "unit" rates below ¾d., with an addition of 10 per cent. for domestic consumption, water-heating and cooking. This suspension applies to electricity used during the period from May to September, when the coal required for generating electricity (assuming weather conditions similar to those of 1941) would amount to 125,000 tons, or an average of 5,000 to 6,000 tons a week.

The Board's domestic tariff introduces a ½d. rate after the consumption of 360 kWh in a two-monthly period. All use of electricity above this "ceiling" will now be discouraged by suspension of the lower rate. Besides this charge the water-heating rates of ½d. and ¼d., and the ½d. step in the large-scale cooking tariff will be suspended.

Aircraft Factory Lighting

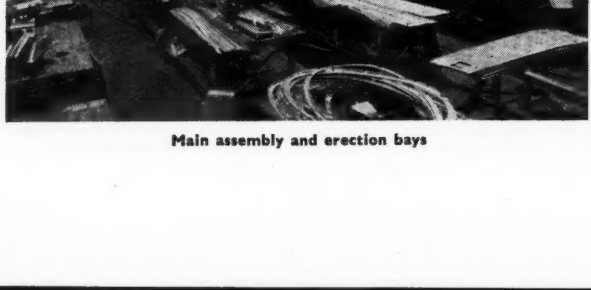
A LIGHTING installation comprising about 1,500 points with a total loading of 350 kW has been recently carried out at an aircraft works by the Metropolitan-Vickers Electrical Co., the scheme being based on experience gained at two other factories of the same company.

In the main assembly shop, where the work is at greatly varying levels, 175 high-mounted 400-W mercury vapour lamps with dispersive reflectors give 12.5 ft.-candles at the working plane. In the annexe 10 ft.-candles are provided by 129 units rated at 125 W. Mercury discharge lamps of 250 W are employed in the sub-assembly and fine-assembly departments of an auxiliary factory and in the press shop, 123 lamps being required to give 11 to 12 ft.-candles in one case and 51 lamps to give 15 ft.-candles in the other.

Fluorescent lamps are used for the sub-assembly and small assembly departments of the main factory, where bench work and small jig work are done; illumination values of 12.5 and 10 ft.-candles are furnished by 170 units of 400 W each and 84 of 125 W. Similar 125-W lamps at 456 points give a general illumination of 15 ft.-candles in the large machine shop. In the anodising shop thirty-two 80-W lamps of the same type give 12.5 ft.-candles.

The spray shop is lighted to an intensity of 10 ft.-candles by 143 "Cosmos" 300-W gas-filled clear lamps in Buxton-tested flame-proof fittings. In addition to the general lighting mentioned, some departments, *e.g.*, tooling and inspection, require illumination values of up to 50 ft.-candles, which is provided by gasfilled lamps in trough reflectors.

For the 12-V bus-type portable lamps employed in the jig assembly department, each fitting has a parabolic pressed steel reflector with a universal joint and a spring grip for fixing. The lamps can be plugged into holders spaced 24 in. apart on a length of strip-light mounted in the fuselage.



Main assembly and erection bays

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Venner Time Switches, Ltd.—The balance of the profit and loss account for 1941, after providing for all charges, including depreciation, income tax and N.D.C., and after writing off expenditure on new patents, is £29,127, to which is added £378 brought in, making £29,505. From this is deducted income tax on profits to date, £5,700, amounts paid and payable under the War Damage Act, £4,594, and dividends on the cumulative preference shares for the eighteen months to September 30th, 1941, £3,600, leaving £15,611 to be carried forward. In the previous year, after transferring £13,000 from the general reserve and paying the preference dividend for the half-year to March 31st, 1940, the carry-forward was reduced from £1,706 to £308.

In his speech, at the annual general meeting last week the chairman, Viscount Falmouth, said that the improved output during the early months of 1941 was continued throughout the year and this was reflected in an increase in trading profit by £46,000 to £62,870. Output for 1942 to date was well up on that for the corresponding period of last year, and the total of work ahead was very satisfactory.

Babcock & Wilcox, Ltd., in reporting a fall in the available balance from £717,347 to £616,021, state that the amount of unexecuted orders on the books at the close of the year was again at a satisfactorily high level. Certain capital assets and trading items affected by the extension of the war have been written off.

In his speech, which has been circulated in advance of the annual meeting on May 28th, Sir John Greenly, chairman, says that although war conditions have imposed additional heavy burdens on the company, the board has been able to recommend the maintenance of the ordinary dividend and bonus without drawing upon reserves. He enters a protest against irresponsible and ill-informed critics who assert that men and managements are not devoting their whole energies to achieving the fullest possible production.

Associated British Engineering, Ltd., which controls the Brush Electrical Engineering Co., Ltd., has given notice of redemption of the remainder of its 5 per cent. funding certificates. These were issued to preference shareholders in satisfaction of arrears of dividend and the outstanding amount at March 31st last year was about £21,000. Redemption will be made as from July 15th at the rate of £1 less tax at 10s. per £1 nominal value with interest to date.

The Sphere Investment Trust, Ltd., reports that gross dividends received during the year ended March 31st, prior to deduction of income tax, amounted to £105,781, an increase of £1,413 on the previous year. After providing for interest on debenture stock, administration and other expenses, the revenue account show a credit balance of £36,234, to which is added £67,359 brought forward, making £103,593. Dividends on the cumulative preference (6 per cent.) and ordinary (5 per cent.) shares absorb £18,000 and £15,000 respectively, leaving £70,593 to be carried forward. The market value of quoted investments and the estimated value of the few unquoted investments showed, at March 31st, a depreciation of £345,689, which was covered to the extent of £150,593 by the carry forward on reserve and revenue accounts.

Johnson & Phillips, Ltd.—Presiding at the annual meeting last week, Mr. G. Leslie Wates, chairman, pointed out that the trading profit for the first time in the company's history had exceeded £500,000, this figure being arrived at before taxation. The great bulk of the company's plant and machinery had been worked to the maximum capacity during the year, and this had necessitated special care and a large expenditure on repairs and maintenance. Scientific development which, as always, was most active in time of war, might quite possibly produce a change in the types of cable in use, which might make some parts of the plant redundant.

Laurence, Scott & Electromotors, Ltd., record a net profit for 1941 (after paying E.P.T.) of £95,856, which compares with £119,178 in 1940. A sum of £5,360 (£5,732) is brought in and after providing for preference capital redemption fund £6,553 (£6,262), income tax £52,000 (£55,000), staff funds £8,200 (£8,800) and an ordinary dividend of 12½ per cent. (15 per cent.), £4,957 is carried forward. The decrease in available net profit is stated to be due to incidence of taxation and to providing for war damage risks for more than two years. Turnover was in excess of that of the previous year.

The Ever Ready Co. (Great Britain), Ltd., reports a profit for the year ended March 31st, amounting to £571,934, which compares with £621,440 in 1940-41. A sum of £101,420 (£72,564) was brought in and the following allocations were made: to reserves, £130,000 (£150,000); staff fund, £14,000 (£11,000); donations, £4,647 (£7,424); final preference dividend 5 per cent., making the maximum of 10 per cent. (same); and final ordinary dividend 20 per cent. with a bonus of 5 per cent., making 40 per cent. for the year (same). This left £100,547 to be carried forward.

Richard Johnson & Nephew, Ltd., record a net profit for the year ended March 31st last of £41,606 (£47,895). Dividends on the 7 per cent. preference capital took £10,500 (£10,762), staff pensions £7,500 (£10,000 and £2,500 reserved for paid holidays) and reserves £10,000 (same). After payment of the ordinary dividend of 9 per cent. (same), there was £38,892 (£38,786) to be carried forward.

The Calcutta Electric Supply Corporation, Ltd., is paying a final dividend of 3½ per cent. against 3 per cent. last year, which compensates for the smaller interim distribution and makes the total for the year again 7 per cent.

The British Columbia Power Corporation, Ltd., received a gross revenue of $18,701,685 in 1941. Expenses took $8,667,970, depreciation and renewals $2,549,751, property taxes $841,779 and taxes on income $2,379,400, leaving an

operating income of $4,262,784, to which is added income from investments $37,976, less loss on sale of investments $10,596, leaving $4,290,164. After deducting bond interest, amortisation bond refunding expense and preference dividends $2,217,405, and dividends on "A" shares $2,000,000, there remained a surplus of $72,759.

The Oriental Telephone & Electric Co., Ltd., reports that consideration will be given to the payment of a final dividend on the ordinary shares when the accounts for the year ended December 31st last have been completed. An interim dividend of 5 per cent. (same) has been paid; in 1940 the total distribution was 16 per cent.

The River Plate & Other Securities Corporation is paying a final dividend of 5 per cent., ¼ per cent. less than in the previous year, making a total distribution for the year of 7 per cent. against 7¼ per cent.

The Rheostatic Co., Ltd., is to pay a dividend of 10 per cent. (same). The net profit for the year ended September 30th last was £7,100, as compared with £8,017 in the previous year.

The Brazilian Traction, Light & Power Co. has declared a dividend of 40 per cent. per share, as last year.

The Imperial Continental Gas Association, which owns electricity and gas undertakings in Belgium and France, is again paying no dividend.

Radio Rentals, Ltd., are maintaining their interim dividend at 4 per cent.

New Companies

Dawson Electrical Co., Ltd.—Private company. Registered May 6th. Capital, £1,500. Objects: To acquire the business of an electric fire and components manufacturer and metal stamping worker carried on by Doris E. Dawson at 28, Church Street, Kidderminster, as the Dawson Electrical. Subscribers: A. A. Cohen and Lily M. Dawson, both of 112, Mill Street, Kidderminster. A. A. Cohen is the first director. Secretary: Lily M. Dawson.

Relay Systems (Earlestown), Ltd.—Private company. Registered April 29th. Capital, £500. Objects: To carry on the business of relayers of radio and television, consulting wireless experts, manufacturers of and dealers in wireless and electrical appliances and accessories, etc. Directors: A. R. Duckett, Moss Houses Cottage, Foulridge, near Colne; F. Nuttall, Oak Dene, Rawtenstall, and J. C. Wilkinson, 78, Breach Road, Marlpool, Heanor. Registered office: 11, Nicholas Street, Burnley.

Companies' Returns

Statements of Capital

Curtis Manufacturing Co., Ltd.—Capital, £6,000 in 6,000 shares of £1 each. Return dated October 23rd, 1941 (filed March 2nd, 1942). All shares taken up. £1,000 paid. £5,000 considered as paid. Mortgages and charges: Nil.

Heatly Electric Forgings, Ltd.—Capital, £1,000 in £1 shares. Return dated January 14th, 1942. All shares taken up. £1,000 paid. Mortgages and charges: Nil.

Drake & Gorham, Ltd.—Capital, £125,000 in 125,000 shares of £1 each. Return dated December 9th, 1941. All shares taken up. £85,000 paid. £40,000 considered as paid. Mortgages and charges: £39,688 debenture stock.

Electricity Services, Ltd.—Capital, £5,000 in 5,000 shares of £1 each. Return dated January 2nd. 4,975 shares taken up. £4,515 paid. £460 considered as paid. Mortgages and charges: Nil.

Kartret Switchgear, Ltd.—Capital, £2,500 in 2,500 shares of £1 each. Return dated January 2nd. All shares taken up. £2,500 considered as paid. Mortgages and charges: Nil.

Increase of Capital

Ultra Neon, Ltd.—The nominal capital has been increased by the addition of £2,000 beyond the registered capital of £1,000. The additional capital is divided into 2,000 non-redeemable "A" shares of £1 each.

Mortgages and Charges

Sifam Electrical Instrument Co., Ltd.—Satisfaction in full on April 27th, 1942, of debentures authorised June 7th, 1932, and registered June 17th, 1932. According to the register of mortgages the debentures registered June 17th, 1932, originally secured £2,000.

Star Electrical Co., Ltd.—Satisfaction to the extent of £150 on December 24th, 1935 (£50), January 30th, 1937 (£50), and December 31st, 1937 (£50), of debentures authorised December 14th, 1933, and registered December 29th, 1933. (Notice filed April 25th, 1942.)

Priory Electric Service (Coventry), Ltd.—Debenture dated April 10th, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Thos. E. Morton, 35, Russell Terrace, Leamington Spa.

Electrical Equipments (Cardiff), Ltd.—Assignment on April 17th, 1942, of contract moneys to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Receiver Appointed

W. A. F. Co., Ltd.—C. W. J. Mason, Regina House, 1/5, Queen Street, E.C., was appointed receiver and manager on April 29th, 1942, under powers contained in debenture dated June 13th, 1941.

Bankruptcies

Maddock Bros. (a firm), electrical engineers, 7, The Temple, Dale Street, Liverpool.—Receiving order made April 30th on a creditor's petition.

G. W. Linsell, radio and electrical dealer, 26, London Road, St. Albans.—Proofs for dividend by May 26th to the trustee, Mr. A. H. Ward, 29, Russell Square, London, W.C.1.

Liquidations

Century Refrigeration (1938), Ltd.—Proofs for dividend by May 26th to the liquidator, Mr. P. Phillips, 76, New Cavendish Street, London, W.1.

STOCKS AND SHARES

TUESDAY EVENING.

THE difficulty of obtaining 4 to 4½ per cent. interest on well-covered securities continues to be a pronounced feature in the Stock Exchange markets. A good deal of the money realised by the recent requisitioning by the Government of Canadian, Indian and other stocks, has yet to find a permanent home. The money is likely to be considerably swollen by the Government's acquiescence in the desire on the part of borrowers, who are entitled to carry out such wishes, to convert existing securities into others bearing a lower rate of interest. Reference has been made here on several occasions to this possibility, and the Chancellor of the Exchequer last week confirmed the expectation that such conversions will now be allowed to take place with no more than the necessary restrictions.

The postponement of the fuel rationing scheme until after the Whitsun recess of the House of Commons exercised no appreciable effect upon Stock Exchange prices.

Home Railways

Discussion in the House of Lords on the subject of unifying the ownership of the Home Railway companies, led to an emphatic declaration by the Minister of Transport that an attempt of such a nature at this time would cause confusion and delay and far from furthering the war effort would unquestionably hamper it. Lord Strabolgi advocated unification of the railways on the ground of efficiency. He said that if the State bought out the railway companies at their present Stock Exchange value of about £750 millions, it would result in a saving to the Exchequer. He compared this with the amount now being paid as rent for the use of the railways.

The Government's Profit

His Lordship did not mention that, according to the recent Board of Trade report, the Government made a profit last year of £65 millions out of the Home Railway earnings, against the guaranteed payment to the companies of £43½ millions. The attention drawn to the market by the Board of Trade report soon subsided and prices, although remaining steady, attract little notice from the public. Southern Railway stocks hold their ground, and the pre-ordinary issues, particularly the debenture stocks, maintain a firm front in company with the quotations for gilt-edged securities as a whole.

Obsolescence

At the meeting of Johnson & Phillips last week, the chairman brought out an interesting point that will affect not only his company, but a good many others. He pointed out that scientific development which, as always, is most active in time of war, may quite possibly produce a change in the types of cable in use, and this may make some parts of the plant redundant. He mentioned this in connection with the fact that the company had worked the great bulk of its plant and machinery to the maximum during the year, with the result that special care, and a large extra cost in repairs and maintenance, had been necessary. The company is making provision for such possibilities, but as the amount which is available for dividend purposes comes to within £4,000 of last year's figure, the 15 per cent. dividend is maintained. At 60s. the price shows a gain on the week of the dividend deduction of 1s. 6d. per share gross.

Laurence, Scott

Laurence, Scott & Electromotors fell a florin earlier in the month when the reduction in the dividend from 15 to 12½ per cent. was announced. The report which came out last week shows that the decline in the profit which led to the dividend being lowered was due to provision for E.P.T., while £12,000 is also set aside for contributions and premiums under the War Damage Act. The company's turnover actually increased during the year, and the item of cash £74,000 in the balance sheet, is considerably higher on the year. Taxation reserve is raised to £161,300. At the current price of 9s. ex dividend, the shares pay nearly 7 per cent. on the money. They may be regarded as one of the promising investments that are likely to attract attention from the after-war prospects of the company.

Ever Ready Figures

The Ever Ready Co. (Great Britain) will hold its annual general meeting on June 4th, when the statement of accounts and the company's report will make pleasant subject for comment by the chairman. The net profit for the year of £571,934 is about £50,000 less than that of the previous year, owing to higher costs of production. The company did not put up its prices during the year which ended March 31st last; but, on April 1st, the prices of all wireless batteries sold to the public were advanced. The dividend of 40 per cent. maintains the previously-paid rate, and the balance sheet shows a strong position. Goodwill and patents have been written off. In British Government stock, free loan to the Government and cash, the company has £630,000, equal to 10s. per share on the total issued capital. At 31s. 6d. ex dividend the 5s. ordinary stock units give a yield of £6 7s. 0d. per cent. on the money.

Price Fluctuations

Shares in companies connected with telephony are in request. For the past few weeks there has been a demand for these

(*Continued on page* 673)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939–40	Dividend 1940–41	Middle Price May 19	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	15	12½	55/–	..	4 11 0
British Power and Light	6	6	28/6	..	4 4 3
City of London ..	7	7	27/6	..	5 1 9
Clyde Valley ..	8	8	40/–	..	4 0 0
County of London..	8	8	37/6	..	4 5 6
Edmundson's:					
7% Pref. ..	7	7	35/–	..	4 0 0
Ord.	6	6	28/6	..	4 4 3
Elec. Dis. Yorkshire	9	9	42/–	..	4 5 9
Elec. Fin. and Securities	12½	12½	48/9	+⅛	5 2 6
Elec. Supply Corporation ..	10	10	45/–	..	4 9 0
Isle of Thanet ..	2	Nil	11/3	..	—
Lancs. Light and Power	7½	7½	35/–	..	4 5 9
Llanelly Elec. ..	5½	5½	22/6	+6d.	4 17 9
Lond. Assoc. Electric	4½	4	18/9	+6d.	4 5 10
London Electric ..	6	6	25/–	..	4 16 0
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S...	8	8	36/3	..	4 8 6
Midland Counties ..	8	8	39/6	..	4 1 0
Mid. Elec. Power ..	9	9	42/–	..	4 5 9
Newcastle Elec. ..	7	7	27/6	..	5 1 10
North Eastern Elec. Ordinary ..	7	7	31/3	..	4 9 7
7% Pref. ..	7	7	34/6	..	4 1 2
Northampton ..	10	10	46/3	..	4 6 7
Notting Hill 6% Pref. (£10) ..	6	6	9	..	—
Northmet Power:					
Ordinary ..	7	7	35/9	..	3 18 4
6% Pref. ..	6	6	32/6	..	3 13 10
Richmond Elec. ..	6	6	25/–	..	4 16 0
Scottish Power ..	8	8	39/6	..	4 1 0
Southern Areas ..	5	5	21/3	..	4 14 0
South London ..	7	7	26/–	..	5 7 8
West Devon ..	5	5	22/–	..	4 11 0
West Glos. ..	4½	3½	20/–	..	3 10 0
Yorkshire Elec. ..	8	8	40/–	..	4 0 0
Overseas Electricity Companies					
Atlas Elec. ..	Nil	Nil	4/3	+3d.	—
Calcutta Elec. ..	8*	7*	20/9	+9d.	—
Cawnpore Elec. ..	10	10	25/–	..	8 0 0
East African Power	7	7	27/–	..	5 3 8
Jerusalem Elec. ..	7	5	18/9	..	5 6 8
Kalgoorlie (10/–) ..	7½	7½	7/6	..	10 0 0
Madras Elec. ..	6*	4*	15/–	..	5 6 8
Montreal Power ..	1½	1½	23½	+½	6 7 8
Palestine Elec. "A"	Nil	Nil	18/9	..	—
Perak Hydro-elec.	6	7	5/–	..	—
Shawinigan Power	83cts.	90cts.	14½	..	—
Tokyo Elec. 6% ..	6	6	12½	..	—
Victoria Falls Power	15	15	72/6	..	4 2 9
Whitehall Inv. Pref.	7½	5	15/9	..	6 7 0

Company	Dividend 1939–40	Dividend 1940–41	Middle Price May 19	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1950–70	5	5	110½	..	4 10 6
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	109	..	4 2 7
1963–93	3½	3½	103½	..	3 7 8
1974–94	3½	3½	99	..	3 5 8
London Elec. Trans. Ltd.	2½	2½	95	+1	2 12 8
London & Home Counties 1955–75	4½	4½	112	..	4 0 4
Lond. Pass. Trans.:					
A	4½	4½	120½	..	3 14 9
B	5	5	117½	+1	4 5 1
C	3	2½	40½	..	7 2 0
West Midlands J.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo.-Am. Tel.:					
Pref.	6	6	112½	..	5 6 8
Def.	1½	1½	26	..	5 15 5
Anglo-Portuguese .	8	8	13/9	–⅛	11 12 10
Cable & Wireless:					
5½ Pref.	5½	5½	97½	+1	5 12 10
Ord.	4	4	58	+½	6 18 0
Canadian Marconi $1	Nil	4cts.	5/–	..	3 7 0
Globe Tel. & Tel.:					
Ord.	8½*	8½*	27/6	..	—
Pref.	6	6	27/6	..	4 7 5
Great Northern Tel.: (£10)	20	20	13½	..	—
Inter. Tel. & Tel...	Nil	Nil	3½	..	—
Marconi-Marine ..	7½	7½	28/9xd	–9d.	5 4 4
Oriental Tel. Ord...	11½*	16	45/–	..	7 2 3
Telephone Props. ..	6	Nil	8/9	..	—
Tele. Rentals (5/–)	10	10	8/9	..	5 14 1
Traction and Transport					
Anglo. Arg. Trans.:					
First Pref. (£5) ..	Nil	Nil	5/–	..	—
4% Inc.	Nil	Nil	10½	..	—
Brit. Elec. Traction:					
Def. Ord. ..	45	45	925	+10	4 17 3
Pref. Ord. ..	8	8	180	..	4 9 0
Bristol Trams ..	8	10	46/3	+⅛	4 6 4
Brazil Traction ..	$1	50c.	14	–½	—
Calcutta Trams ..	8	5½	11/3	..	9 15 6
Cape Elec. Trams..	5	5	19/–	..	5 5 3
Lancs Transport ..	10	10	45/–	..	4 9 0
Mexican Light:					
1st Bonds ..	5	5	81½	..	6 2 8
Rio 5% Bonds ..	5	5	97½	..	5 2 8
Southern Rly.:					
5% Prefd. ..	5	5	64½	..	7 15 0
5% Pref. ..	5	5	111½	..	4 9 6
T. Tilling	10	10	50/–	..	4 0 0
Tilling & B.A. ..	7*	6½*	55/–	..	2 7 3
West Riding ..	10	10	39/6	..	5 1 3

(Continued on next page)

* Dividends are paid free of Income Tax.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price May 19	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord. ..	Nil	7½	24/–	..	6 5 0
Assoc. Elec. :					
Ord.	10	10	45/–	..	4 9 0
Pref.	8	8	38/9	..	4 2 4
Automatic Tel.& El.	12½	12½	52/–	+9d.	4 16 3
Babcock & Wilcox	11	11	43/9xd	..	5 0 6
British Aluminium	10	10	43/3	..	4 12 4
British Insul. Ord.	20	20	93/9	..	4 5 6
British Thermostat (5/–)	18½	18½	14/6xd	+3d.	6 7 6
British Vac. Cleaner (5/–)	12½	10	11/3	..	4 9 0
Brush Ord. (5/–) ..	Nil	6	5/3	+3d.	5 14 3
Callender's ..	15	15	72/6	..	4 2 9
Chloride Elec.Storage	15	15	73/9	−¼	4 1 4
Cole, E. K. (5/–) ..	Nil	7	11/–	..	3 3 8
Consolidated Signal	17	17	72/6	−½	4 3 8
Crabtree (10/–) ..	17½	17½	29/6	..	5 18 8
Crompton Parkinson Ord. (5/–) ..	30	20	22/6	..	4 9 0
E.M.I. (10/–) ..	Nil	6	14/3	..	4 4 3
Electric Construction	10	10	34/6	..	5 16 0
Enfield Cable Ord.	12½	12½	55/–	..	4 11 0
Elect. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	41/3	+¼	4 17 0
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)..	22*	20*	41/3	..	2 8 6
Ever Ready (5/–) ..	40	40	31/6xd	+9d.	6 7 0
Falk Stadelmann ..	7	7½	22/–	..	6 16 4
Ferranti Pref. ..	7	7	27/6	..	5 1 10
G.E.C. :					
Pref.	6½	6½	35/–	..	3 14 2
Ord.	20	17½	83/9	..	4 3 9
Greenwood & Batley	15	13	29/6	..	8 16 4
Hall Telephone(10/–)	10	12½	20/–xd.	+¼	6 5 0
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	22/6	..	4 0 0
Hopkinsons ..	15	15	48/3	+¼	6 4 6
India-Rubber Pref.	5½	5½	21/3	..	5 3 6
Intl. Combustion ..	32½	30	107/6	..	5 11 6
Johnson & Phillips	15	15	60/–xd	+9d.	5 0 0
Lancashire Dynamo	20	20	67/–	+2/–	5 19 4
Laurence,Scott (5/–)	15	12½	9/–xd	..	6 19 0
London Elec. Wire	7½	7½	28/3	..	5 6 2
Lucas, J.	15	15	65/–	..	4 12 4
Mather & Platt ..	10	10	39/6	+9d.	5 1 3
Metropolitan Elec. Cable Pref. ..	5½	5½	21/3	..	5 3 6
Murex	20	20	92/6	..	4 6 9
Pye Deferred (5/–)	25	25	15/–	..	8 6 8
Revo (10/–) ..	5	20	28/9	+¼	6 19 2
Reyrolle	12½	12½	57/6	..	4 7 0
Siemens Ord. ..	7½	7½	26/3	..	5 14 3
Smith, S. (1/–) ..	50	37½	7/–	..	5 7 2
Strand Elec. (5/–)..	2	4	3/6	..	5 14 4
Switchgear & Cowans (5/–) ..	15	10	10/–	..	5 0 0
T.C.C. (10/–) ..	Nil	5	12/6	+¼	4 0 0
T.C. & M.	10	10	41/3	..	4 17 0
Telephone Mfg. (5/–)	9	9	9/3	..	4 17 3
Tube Investments	23½	20	82/–xd	−6d.	4 17 7
Vactric (5/–) ..	4	Nil	6/–	..	—
Vickers (10/–) ..	10	10	16/9	..	5 19 5
Ward & Goldstone (5/–)	20	20	18/6	..	5 8 3
Westinghouse Brake	10	10	47/6	..	4 4 2
WalsallConduits(4/–)	55	55	33/9	..	6 10 4
West, Allen (5/–) ..	7½	7½	5/9	..	6 10 5

* Dividends are paid free of Income Tax.

Stocks and Shares (*Concluded from page* 671)

investments. Automatic Telephones, for instance, have come up from a little under 50s. to the present price of 52s. Telephone Constructions are better at 12s. 6d. Hall Telephones have risen to 20s. Other price-changes in the list of equipment and manufacturing shares include rises of 2s. in Lancashire Dynamos and 1s. 3d. in Revo. Consolidated Signals at 72s. 6d. are ¼ down Chloride Electrical Storage at 73s. 9d. have lost ¼. Mather & Platt strengthened to 39s. 6d. The Electricity Supply group is very steady. Gains of 6d. in Llanelly ordinary and of ¼ in Electrical Finance & Securities lifted the prices to 22s. 6d. and 28s. 9d. respectively. London Associated hardened to 18s. 9d. After their recent rises, Cable & Wireless stocks have quietened down. The preference at 97½ is 1 higher and the ordinary is up 10, to 58. Bristol Trams at 46s. 3d. are ⅛ better.

Hopkinsons have improved to 48s. 3d. and the 7 per cent. preference to 32s. English Electrics are a good market at 41s. 3d. Ransomes & Rapier remain at 9s. 6d.; the dividend of 5 per cent. goes against last year's 6 per cent., both tax free, but the net profit is £2,300 up. Ransomes, Sims & Jefferies, whose dividend is maintained at 7½ per cent., are 23s. Brush ordinary at 5s. 3d. are 3d. better on the capital re-organisation proposals.

B.E.T.

The British Electric Traction Co. fulfilled expectations in declaring a final dividend of 30 per cent., making 45 per cent. for the year on the deferred ordinary capital. The revenue of £767,588 is £19,000 up on the year and the net profit of £527,393 is no more than £4,500 down. The meeting of the company takes place on June 19th next. On the announcement, the deferred rose 10 points, to 925 cum dividend.

It may be of interest to mention that £4,000 of the company's 8 per cent. non-cumulative preferred stock is on offer in the Stock Exchange market at 180 ex dividend. The yield at this price is £4 9s.—not a bad return, in view of the security at the back of the stock. To pay the 8 per cent. dividend takes £106,100 per annum. In the latest accounts the amount available to meet it was sufficient to cover the preferred dividend more than four times.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *can be obtained from the Patent Office*, 25, *Southampton Buildings, London, W.C.*2.

1939

32301. "Portable electric motors particularly for driving domestic apparatus, tools and the like." Kooperativa Forbundet Forening U.P.A. December 22nd, 1938. (544672.)

1940

1323. "Portable electric lamps having two bulbs operated by dry battery or accumulator." A. Bagnasco. January 22nd, 1940. (544704.)

6115. "Demagnetisation." Magnetic Analysis Corporation. April 7th, 1939. (544639.)

7094. "Automatic or semi-automatic telephone systems with party lines." Standard Telephones & Cables, Ltd. April 24th, 1939. (544736.)

9072. "Remote control systems." Aga-Baltic Radio Aktiebolag. May 24th, 1939. (544614.)

11936. "Circuit arrangements including discharge tubes." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). July 19th, 1940. (Addition to 491063.) (Convention date not granted.) (544616.)

12026. "Circuits for amplifying high-frequency oscillations." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). July 22nd, 1940. (Convention date not granted.) (544641.)

13483. "Electric telegraphy." Marconi's Wireless Telegraph Co., Ltd. August 26th, 1939. (544708.)

14412. "Electric circuit interrupters." Westinghouse Electric International Co. September 20th, 1939. (544644.)

15286. "Magnetic field well logger." Standard Oil Development Co. October 28th, 1939. (544676.)

15408. "Process of making electrical sheets of silicon steel." W. P. Williams (Armco International Corporation.) October 17th, 1940. (544678.)

15422. "Turning gear apparatus for elastic fluid turbines." British Thomson-Houston Co., Ltd. October 19th, 1939. (544648.)

15432/15433. "Washing machines." Westinghouse Electric International Co. November 7th, 1939. (544679/544680.)

15453. "Devices for drawing cables through conduits." Standard Telephones & Cables, Ltd., and C. J. Culling. October 18th, 1940. (544654.)

15538. "Insulation of electrical apparatus." British Thomson-Houston Co., Ltd. October 26th, 1939. (544681.)

15547. "High-frequency tanks and resonant cavities." Electrical Research Products, Inc. December 9th, 1939. (544682.)

15560. "Band filters." Akt.-Ges. Brown, Boveri & Cie. September 11th, 1939. (544775.)

15630. "Manufacture of alternating-current dry rectifiers." Westinghouse Brake & Signal Co., Ltd., C. A. Rowley and A. Jenkins. October 24th, 1940. (544743.)

15653. "Electrical carrier-wave signalling systems." Standard Telephones & Cables, Ltd., and F. Fairley. October 24th, 1940. (544746.)

15673. "Operation of high-pressure, mercury-vapour, electric-discharge lamps." British Thomson-Houston Co., Ltd., and H. K. Bourne. October 25th, 1940. (544619.)

15855. "Electric lamp fittings." F. W. Thorpe, Ltd., and F. W. Thorpe. October 30th, 1940. (544620.)

16808. "Piezo-electric crystal arrangements." Marconi's Wireless Telegraph Co., Ltd. November 24th, 1939. (544668.)

17359. "Fluid-pressure actuated electric switches." British Thomson-Houston Co., Ltd. December 6th, 1939. (544685.)

17598. "Construction for elastic fluid turbine diaphragms." British Thomson-Houston Co., Ltd. December 13th, 1939. (544688.)

1941

286. "Electric circuit-breakers of the gas-blast type." Westinghouse Electric International Co. January 11th, 1940. (544755.)

636. "Electric fuse-holders." N. R. Booth. January 17th, 1941. (544626.)

799. "Electric lighting fittings." British Thomson-Houston Co., Ltd., F. Widnall and H. Brecknock. January 21st, 1941. (544692.)

1105. "Photographic objectives." British Thomson-Houston Co., Ltd., and D. Gabor. January 28th, 1941. (544694.)

1327. "Detectors for frequency modulation." Marconi's Wireless Telegraph Co., Ltd. January 31st, 1940. (544696.)

1655. "Composite electricity conductor unit." J. F. O'Brien. February 6th, 1940. (544727.)

1958. "Electro-magnetic pressure-measuring apparatus." British Thomson-Houston Co., Ltd. February 13th, 1940. (544730.)

2689. "Manufacture of photo-sensitive electrodes." Marconi's Wireless Telegraph Co., Ltd. February 27th, 1940. (544733.)

2746. "Apparatus for recording and reproducing sound." W.A.F. Co., Ltd. and H. H. Allen. February 28th, 1941. (Cognate application, 4531/41.) (544760.)

3284. "Fluorescent coatings, and methods of manufacture of such coatings." British Thomson-Houston Co., Ltd. March 14th, 1940. (544763.)

3345. "Sound recording apparatus." W.A.F. Co., Ltd., and H. H. Allen. March 12th, 1941. (544764.)

3498. "Glass solutions." Westinghouse Electric International Co. March 16th, 1940. (544734.)

3519. "Electric motors and generators." AC-Sphinx Sparking Plug Co., Ltd., and D. B. Browne. March 14th, 1941. (544765.)

4428. "Electric storage batteries." Chloride Electrical Storage Co., Ltd. February 28th, 1941. (544770.)

Amended Specification

540941. "Electric oscillation generating circuits." P. B. Vanderlyn and another.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia. — QUEENSLAND. — August 20th. Townsville Town Council. 3,000-kW turbo-alternator (Specification 119). A. Robertson, town clerk, Townville.

SYDNEY.—June 8th. Department of the Interior. Two 1,000-1,500 kW Diesel-driven generating plants.

Formby.—May 25th. Urban District Council. One 2,500-kVA transformer and one 500-kVA transformer. Specifications from the chief electrical engineer, Electricity Department.

Plymouth.—May 30th. City Electricity Department. Condenser tubes, screwed glands and washers. (May 15th.)

South Africa.—SALISBURY.—July 2nd. City Council. Electrical metering equipment. (Contract E.19.)

DURBAN.—June 19th. City Council. Electric link switches and fuse fittings (Contract E.2052). July 17th. Telephone switchboard component parts. (Contract P.263.)

Orders Placed

Bradford.—Electricity Committee. Contract for three-phase static transformers extended to December 31st.—Yorkshire Electric Transformer Co.

London. — ISLINGTON. — Electricity Committee. Recommended. Cable contract renewals for 12 months.—B.I. Cables; Edison Swan Cables; Hackbridge Cable Co.; Telegraph Construction & Maintenance Co.

Newbury.—Education Committee. Accepted. Lighting and power points at senior school (£22).—Wessex Electricity Co.

Sheffield.—Electricity Committee. Accepted. Electrically operated soot blower at power station (£2,640).—Clyde Blowers. Caterpillar grab chain (£2,253).—Newton, Chambers & Co.

Sunderland.—Corporation. Accepted. Electric locomotive for use at the generating station (£2,730).—English Electric Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington.—Extensions to fire station (£4,500); H. Sanderson, borough surveyor, Town Hall.

Hostel, High School for Girls; secretary.

Ayr.—Garage extensions (£5,060); burgh surveyor.

Batley.—Crematorium; T. Mossop, borough surveyor, Town Hall.

Bradford.—Nursery hutments; city architect.

Bridgwater.—School meals scheme (£2,000); borough engineer, Town Hall.

Choppington.—Two colliery canteens; Tasker & Child, Trinity Buildings, New Bridge Street, Newcastle-on-Tyne.

Coalville.—Control centre (£1,477); W. Moss & Sons.

Ellesmere Port.—Shelters (£1,300); C. W. Hitchen, Whitby.

Essex.—Intermediate approved school for boys (£8,750 for equipment, adaptations and maintenance); J. Stuart, county architect, County Hall, Chelmsford.

Frodsham.—Cooking depot (£1,181); A. F. Illidge.

Haslemere.—British Restaurant at Beacon Hill; surveyor, Museum Hill, Haslemere.

Hebburn-on-Tyne.—Canteen extensions for R. & W. Hawthorn, Leslie & Co., Ltd.; J. M. Black, jun., builder, Victoria Road.

Horsforth.—Temporary school with nine classrooms and kitchen; H. Wormald, county education architect, County Hall, Wakefield.

Ipswich.—Site for proposed technical college, Christchurch Park; borough surveyor, Town Hall.

Kilmarnock.—Works canteen (£1,500) for Andrew Barclay, Sons & Co., Ltd., Caledonia Works; manager.

Leeds.—British Restaurant, Holbeck, and day nursery, Rookwood Road; W. S. Cameron, city engineer, Civic Hall.

Macclesfield.—Additions, West Park Hospital (£1,360); county architect, Chester.

Newcastle-on-Tyne.—Fire service depot and billets to be built; J. O. C. Solomon, city property surveyor, Town Hall.

Salvage stores for the City Council (£1,000); Rochester & Kirk, Ltd., builders.

Northants.—Shelters, Thrapston & Corby (£1,760); county architect.

Northwich.—Nursery, Churchwalk (£2,125); W. Forster & Son.

Ormskirk.—British Restaurant at Lathom (£1,100); E. J. Wright, surveyor, Council Offices, Burscough Street.

Pensnett.—Day nursery; K. L. Murray, county architect, County Buildings, Stafford.

Preston.—Canteen; Wilding Bros., Ltd., Alexandra Mills.

Rawtenstall.—Alterations at Kay Street for additional municipal offices, and adapting Longholme Sunday school for school canteen; borough surveyor, Municipal Offices.

South Shields.—Nursery school; N. G. Richardson, borough engineer, Town Hall.

Spalding.—Reinstatement of flour mill, High St.; G. W. Plowman & Sons, corn merchants, High Street.

Torquay.—Sawmill, Teignmouth Road; T. J. Crossman, Ltd.

Wellingborough.—Houses (£3,455); Phillips & Slow, Kettering.
Houses (£1,540), for R.D.C.; A. Underwood, Wollaston.

Wigan.—Adapting premises as residential nursery; Walker Bros. (Wigan), Ltd.

Winsford.—Nursery, Siddorn Street (£2,116); J. Smallwood, Middlewich.

Witton-le-Wear.—Restoration of sawmill and electrical plant destroyed by fire; G. Langstaff & Sons.

Wolverhampton.—Nurseries, Marston Road (£1,630) and Elston Hall (£1,890); borough engineer.

Wrexham.—British Restaurants and nurseries; borough surveyor, 1, Grosvenor Road.

Yeovil.—Adapting Liberal Club as British Restaurant for T.C.; borough surveyor, General Offices, Town Hall.

New Zealand Lake Power Scheme

A HYDRO-ELECTRIC power station for utilising water from Lake Waikaremoana, New Zealand, was opened at Tuai in 1929, and had a capacity of 40,000 kW, later increased to 60,000 kW. The station was built at a level of 1,115 ft. below the surface of the lake, which is situated 2,015 ft. above sea level. In 1935 preliminary work on a new scheme for tapping the lake was put in hand, but the following year the Minister of Public Works ordered its suspension in view of the hazardous conditions under which the men were working.

Four years ago work started on a station, estimated to cost nearly a million pounds, at a point 365 ft. below the level of Tuai. The main feature of this project is the construction of an artificial lake about 80 acres in extent to collect the water discharged from Tuai. The water is then to be carried through a 1½-mile tunnel and siphoned across a swamp to the power-house, which will have a capacity of 40,000 kW.

The *New Zealand Electrical Journal* now reports that the Minister of Public Works has recently announced a decision to tap Lake Waikaremoana on the lines of the 1935 scheme. The new project envisages the construction of a third station approximately midway between the lake and Tuai. At present the bulk of the water flowing from the lake finds its way into the outlet stream by seepages; the former attempt to control these seepages and divert them into the channel was abandoned because of the dangerous nature of the work. The present proposal is to sink a deep shaft and tunnel into the lake to an intake point some distance from the present outlet and 60 ft. beneath the surface. This will enable the huge storage of the lake itself to be used instead of only water coming through the seepages. With the water under control it will be possible to build a new station at about 435 ft. below the lake level and to feed the discharged water to the Tuai plant.

Street Lighting

IN the latest annual report of the Association of Public Lighting Engineers, obtainable for 2s. 6d. from 68, Victoria Street, London, S.W.1, there is much very useful tabulated data on street lighting, these statistics having been expanded to 75 pages at the instance of the Ministry of Home Security to cover installations in areas that are under the charge of officials who are not members of the Association.

In a foreword the president, Mr. E. J. Stewart (Glasgow) points out that the cost of public lighting has tended to increase because of the introduction, or extension, of low-intensity illumination and by reason of rises in wages, cost of materials and payment of allowances to men on war service The number of street lamps lighted normally in the areas from which information has been received is 861,412; about one-sixth of them are stated to be lighted in wartime, but the latter are in a relatively small number of towns. The respective increases of 35 and 68.5 per cent. compared with the 1939–40 returns are due partly to the greater number of places contributing to the tables.

"Starlighting" in accordance with BS/ARP 37 is officially approved of and its usefulness has been affirmed. Many additional illuminated ARP signs have been provided, dimmed and screened according to S.R. & O. No. 74, 1940, while there has been continued substitution of electric bollard-lights for the oil lamps marking street obstructions. Lack of funds and labour has tended to reduce cleaning and the overhaul of fittings. Insistence on the need to save fuel must have slowed down new installations and it has increased criticism, especially of burning lamps all day, or beyond the strict hours of utility, although this is cheaper and simpler when labour is so scarce.

Scientific Research

THE annual report of the Smithsonian Institution (U.S.A.), a bound volume of 512 pages, includes several appendices reviewing progress in different branches of science. It is recorded that the four-year old radio programme, a pioneering effort to popularise science and the arts by means of dramatised broadcasts, radiated every Sunday from 80 stations, continued its unabated popularity during the year ended June, 1940.

The Radiation Division's investigation of the relation of light to plant growth carried forward promising experiments which indicated the usefulness of fluorescence in the study of photosynthesis. Green algæ exposed to ultra-violet light of certain short wavelengths showed 4·5 times the growth rate of control cultures.

The six major events in the story of transmutation, which takes place when two nuclei meet and enter into reaction, by projecting one against the other, are reviewed, as is also the present status of national standards of measurement. In describing the development of the rubber industry during the last one hundred years the fact is recalled that Faraday was the first to publish the ultimate analysis of rubber, the carbon-hydrogen ratio which he determined being still in use to-day.